NEVADA'S
PRONGHORN ANTELOPE

Ecology, Management and Conservation

NEVADA
DIVISION OF
WILDLIFE

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Ecology, Management and Conservation

By

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1983

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BIOLOGICAL BULLETIN NO. 13

This document is the result of studies undertaken with Federal Aid in Fish and Wildlife Restoration funds under Pittman-Robertson Projects.

May 2003

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THE PRONGHORN'S PLACE IN OUR LIVES

A herd of pronghorn bolts across a low sage flat trailed by the billowing dust left in its wake. The animals progress with a fluid gate, barely discernable movement of their heads and backs, their churning limbs masked by the shimmering heat waves. The illusion emerges that these animals are in fact flying above the surface, unfettered by the bounds of gravity. The second fastest land animal on earth, the herd quickly passes out of sight, leaving the viewer in awe of the species' speed and grace.

This is the image that pronghorn have been leaving in the mind of humans for as long as the two species have cohabitated the same ground. Early man quickly recognized the value of these uniquely adapted animals. Their adaptations of speed and eyesight evolved over the eons as the species adapted to the forces of nature - climate, predation, habitat – in order to establish its niche in life. These adaptations tested the prowess of the continent's newcomers- the bipedal, intelligent predators that had emigrated from Asia.

Early man had little impact upon pronghorn. Human predation did occur as man learned the vulnerabilities of their prey, overpowering individual animals at waterholes or in other situations that mitigated the pronghorns' adaptations. Early man was also a creature of the ecosystem and he too adapted to become more effective at preying upon the swift ungulates. His intelligence guided him to construct traps within which he could kill antelope in greater numbers. Still, human distribution on the plains and Great Basin was restricted by his own physical limitations, thus man did not appreciably alter pronghorn populations. Aboriginal humans developed a respect for the animals, both as a source of sustenance and of inspiration.

Later, a new kind of human arrived in North America. These modern men brought with them tools that allowed them to effectively prey upon antelope in a manner unlike that of their natural predators. The scope of this new predation ensued so rapidly that pronghorn were unable to adapt to the change. Pronghorn numbers diminished at an unprecedented rate as modern humans increased and as aboriginal humans familiarized themselves with the guns, horses and hunting tactics introduced by their European relatives. They also brought with them new beasts that intruded upon the pronghorns' niche, competing for forage and water, providing additional biomass that supported greater numbers of predators, causing landscape alterations and introducing unfamiliar diseases. Modern men recognized the need to exploit natural resources to support their expansion throughout the continent. Moreover, they placed a priority upon the domestic animals that they brought with them; the sedate, manageable livestock were far more valuable as a source of protein, hide and tallow and as beasts of burden.

However, modern man also possessed an intellect that allowed him to recognize the effect he had on his surroundings. His application of science resulted in the development of the concept of conservation. He recognized his role in the plight of the once common pronghorn and he initiated efforts to not only rescue them from oblivion but also to improve their distribution and numbers. This Plan testifies as an example of our acknowledgement that pronghorn have a place in our lives. Fulfillment of mankind's responsibility for the welfare of other species will ensure that we will always be stirred by the sight of a herd of pronghorn flying over the landscape.

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Biological Bulletin No. 13

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ACKNOWLEDGEMENTS

In 1983, George K. Tsukamoto of the Department of Wildlife prepared a document titled *Pronghorn Antelope Species Management Plan.* That manuscript provided a detailed description of this unique animal and its habitat. His paper also defined those values applied to pronghorn by humans and the influences that mankind has had upon the species. As its title implies, the original document also served as a plan for the future management of pronghorn by the Department (later, the Division of Wildlife, or NDOW). It defined simple management objectives and listed the goals, problems and strategies attendant to those objectives.

Division personnel have borrowed liberally from the 1983 text to prepare this current revision - now published as a biological bulletin. Advances in the understanding of the species along with contemporary management applications served as the impetus for revision. Departing from the structure of the original publication, specific policies and planning prescriptions will now be depicted in a separate document titled *Nevada Division of Wildlife's Pronghorn Species Management Plan.* That plan will be published simultaneously with this bulletin.

Regional supervising game biologists Kraig Beckstrand, Larry Gilbertson, Craig Mortimore and John Himes labored on the text and layout of both this bulletin and the planning document. Their efforts were conducted under the direction of Game Bureau Chief Gregg Tanner. Special thanks go to the many NDOW biologists and staff that reviewed the initial draft and provided valuable comments to improve the manuscript. The Division also extends its appreciation to other agencies and organizations and to the general public that took the time to review the document and provide valuable comments.

Division staff biologist Ralph Phenix produced many of the figures within this bulletin. He was able to produce these maps by utilizing data provided by land management agencies as well as the Division. Photo credits go to a number of NDOW biologists, wildlife biologist Jim Yoakum and sportsman Andy Stinson. Craig Mortimore created the illustrations.

Funding for this project was derived from tag and license revenues and grant assistance provided by the Pittman-Robertson Federal Aid in Wildlife Restoration program.

INTRODUCTION

The North American population of pronghorn (*Antilocapra americana*) experienced sharp declines during the 1800's, culminating in lower population levels in the 1930's compared to its former abundance and wide distribution. Populations in Nevada generally followed the patterns of the continental population as a whole. However, some individual herds fared much better. Prior to 1947 pronghorn management in Nevada was but a token effort. The establishment of the Department of Fish and Game in 1947 (now known as the Division of Wildlife) and the availability of funds from Federal Aid in Wildlife Restoration (Pittman-Robertson Act of 1937) resulted in much greater effort expended to gather the biological information necessary to determine annual status and trend of pronghorn populations in the state.

The public has expressed a greater interest in pronghorn through the ever-increasing demands for the limited number of hunting tags available annually. The long-term trend has been for increased demand for the consumptive as well as non-consumptive uses. The need for long-range planning by the then Department of Wildlife to identify and implement sound resource management programs was a necessary prerequisite for the development of the original version of this *Plan* in 1983.

This updated *Plan* again provides the historical background and significant biological and statistical information for the formulation of sound management direction. Past methods are presented and compared with contemporary procedures. Goals, objectives and strategies for management are discussed. The *Plan* is intended to aid in the decision-making process - to increase the effectiveness and efficiency of the Division and the Commission as they assess the future management of the pronghorn. It also serves to inform and educate the sportsmen of the State and the public in general to whom it will ultimately benefit.

Partnerships with federal and state agencies, conservation organizations and key individuals are critical to preserving pronghorn.. Credit is served to the federal agencies where they have not only supported pronghorn species expansion but also the habitat improvement projects that have sustained these animals. Additionally, pronghorn management involves sportsmen organizations and other conservation groups which have funded trapping and translocation, water development and key habitat purchases.

HISTORICAL BACKGROUND

The pronghorn was probably first observed by Europeans in Mexico during the mid-16th century. According to Nelson, (1925) pronghorn were distributed in favorable habitat throughout the western half of the United States, except for the northern Pacific coastal areas, and in portions of Canada and Mexico. Early day explorers and fur trappers recorded the abundance of pronghorn in the United States. Lewis and Clark observed vast herds during their exploration of the northwest. Nelson (1925) conservatively estimates that 35 to 40 million pronghorn inhabited North America prior to the arrival of European man. Seton (1929) estimated 40 million pronghorn in the western United States alone near the year 1800. With the advancement of civilization and the relentless killing of pronghorn for food or pleasure and by the human occupation of preferred habitats the population decreased to a fraction of its pristine abundance, Yoakum (1968). By 1918 the United States pronghorn population had dwindled to its lowest point in history with an estimated 13,000 animals, Hoover, et al., (1959). By 1922-24 an upward trend was apparent when the U.S. pronghorn population estimates were more than doubled in six years with an estimated total of 26,604, Nelson, (1925).

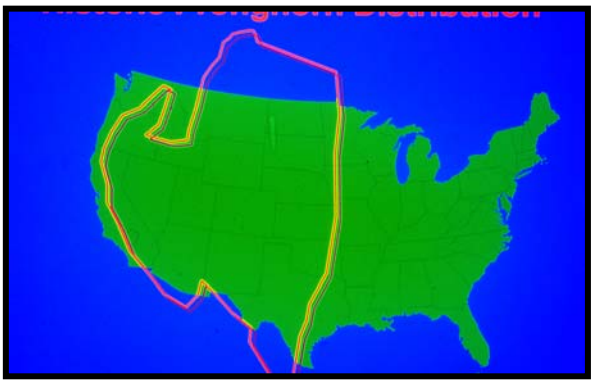


Figure 2. Probable historic range of pronghorn in the United States.

Robert P. McQuivey, former Habitat Bureau Chief for NDOW, compiled numerous historic references of pronghorn in Nevada (1999). Most references make note of the scarcity of game in what is now Nevada. Many sightings imply that pronghorn were the only ungulates observed in much of the northern half of the state. These accounts are certainly influenced by the fact that pronghorn, more than any other Nevada ungulate, occupied the valley floors through which westward travel proceeded.

In the mid-1800's pronghorn were more numerous than they are today, but by no means were they abundant. As exploration increased and settlement began, the pronghorn played an important role in providing food, which was otherwise scarce in the area. During the height of mining development and settlement (1859-1880) many wildlife species were heavily exploited. More importantly, many of the existing fertile valleys and upland meadows were fenced for cultivation and many of the waters appropriated for irrigation and livestock use. These changes were accelerated as a result of the Homestead Act of 1862 and other similar land grant acts.

Domestic animals were introduced in Nevada during this period. The first cattle known to have entered Nevada were 47 head herded by Joseph Walker in 1834 on his exploration of the Humboldt River. Mormon pioneers brought cattle with them when they established the first settlement in the Nevada Territory at present day Genoa. Cattle and sheep numbers increased modestly at first, gaining greater momentum through the 1850's following the discovery of gold in present day California. With the discovery of the Comstock Lode in 1859 and the ensuing rush, the livestock industry boomed. Both cattle and domestic sheep were trailed through Nevada and sold to the ready markets. In 1867, there were an estimated 36,000 cattle, 24,000 sheep and 5,000 horses in Nevada. By

the 1870's, the livestock industry took a more permanent posture with the establishment of large cattle ranches.

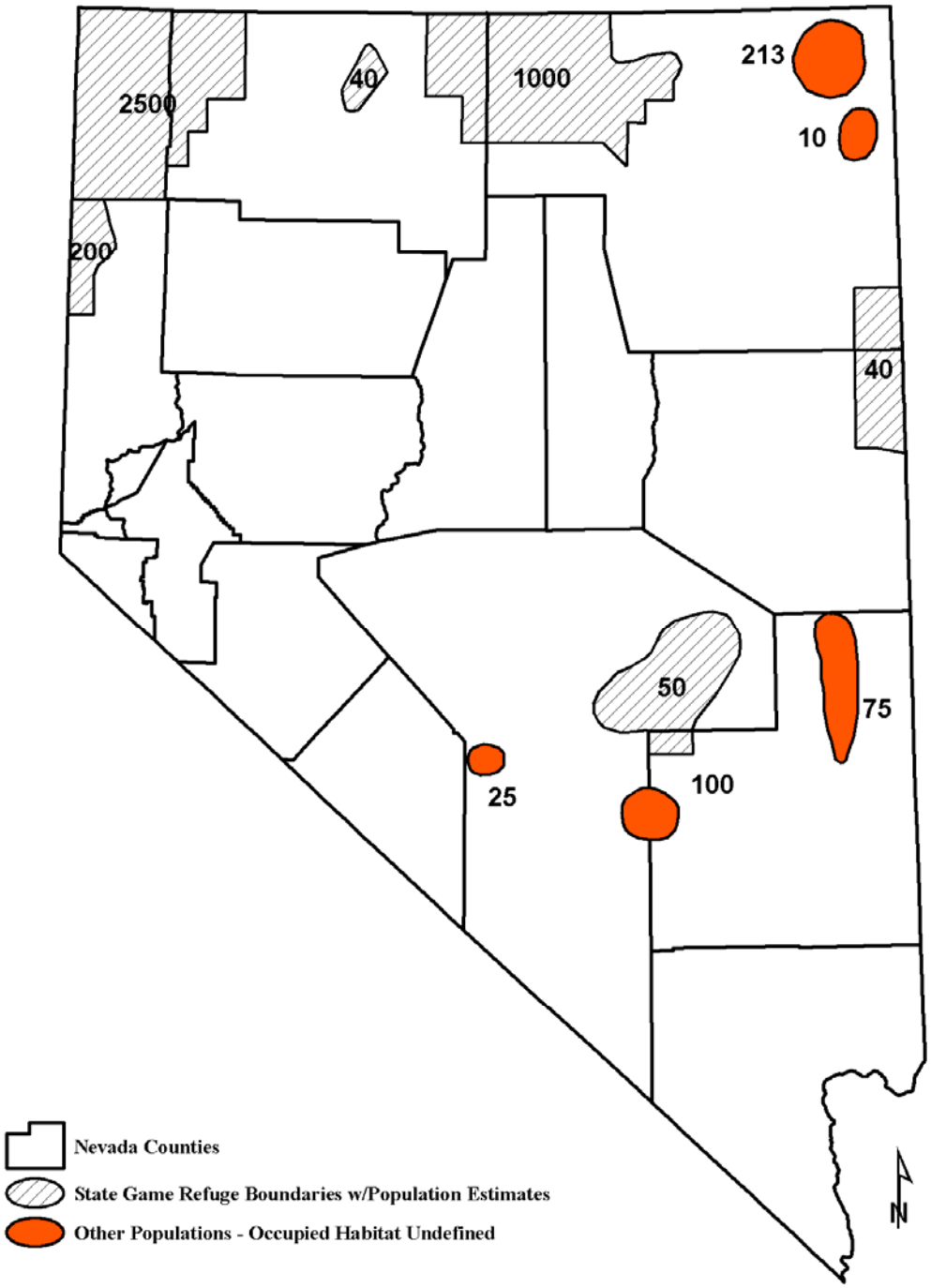
By 1880 these numbers expanded greatly with an estimated 250,000 cattle, 259,000 sheep and 34,000 horses using the open ranges of Nevada and competing with native wildlife for forage and water. No area of the state was immune to the onslaught of livestock grazing. In the early days the only respite from grazing was usually due to the weather (Hazeltine, et al. 1961). During this period grazing was continuous during all seasons. In addition to the permanent herds of domestic stock grazing the open ranges there were numerous transient herds of domestic sheep and, to a lesser extent, cattle.

Overgrazing of the range was inevitable with this increased use. A report in the December 3, 1886, Carson City Appeal warned of overgrazing, declaring that, "There are enough cattle on the ranges, it is time to call a halt." In addition to domestic livestock thousands of feral horses roamed the range. Horses were well adapted to the conditions in Nevada and by the turn of the century their numbers had grown so large as to create concern by the stockmen of the state. In 1900, the Nevada Legislature passed a law allowing unbranded horses to be killed. In 1910, an estimated 100,000 feral horses still ranged throughout the State despite the removal of 15,000 head in 1901-02 (Hazeltine, et al., op. cit.).

Pronghorn populations dwindled rapidly during this era. Some herds were lost and the former statewide distribution was reduced to some 11 areas of the state by 1922, (Nelson, op. cit.). Following the first decade of the twentieth century, interest in wildlife conservation and protection blossomed throughout the United States. It was during this period that organizations such as the Boone and Crockett Club, Wildlife Protection Fund, The Audubon Society and The American Game Protective Association were organized and made their desires known relative to wildlife conservation. This was the beginning of pronghorn management in the U.S., but in Nevada, management was to come a few years later.
In 1917 the Nevada State Legislature closed the hunting season for pronghorn, mountain sheep, and elk until 1921; and in 1923, Governor Scrugham was empowered by the State Legislature to create 25 State Game Refuges. After consultation and assistance from the U.S. Biological Survey, suitable locations were established specifically for the protection of pronghorn and sage grouse.

With the continued development and growth of the conservation movement throughout the nation and in Nevada, a great concern was expressed for the welfare of the pronghorn. Much emphasis was placed by state and federal governments on protection of wildlife resources, primarily through establishment of refuges. On January 26, 1931, by Executive Order, the Charles Sheldon Pronghorn Refuge was created and a few years later on December 21, 1936, 536,956 acres were withdrawn to create the Charles Sheldon Pronghorn Range. The primary purpose for the Sheldon Refuge and Range was the conservation and development of wildlife, primarily pronghorn. These acts were the genesis of pronghorn management in Nevada.

Figure 3. Pronghorn distribution in Nevada - 1923
(Adapted from E.W. Nelson, 1925)



LIFE HISTORY

Taxonomy

The pronghorn taxonomic classification dates from Ord's 1818 description in the *Journal de Physique*, LXXXVII, (pg. 149). The genus *Antilocapra* resulted from joining the Latin *antholop*, meaning pronghorn, and *capra*, meaning goat. The genus is unique to North America and has only one species. Some common or local names include pronghorn, prong-buck, goat, speed-goat and loper. The Mexican term is *berrendo* meaning pinto. The predominant common name is antelope, a misnomer considering its taxonomic distinction from the ungulates of the same name in Asia and Africa.

Morphology

Morphologically, the pronghorn is a very distinctive animal. The hooves are split with the front slightly larger than the hind and there are no dewclaws. Unlike the deer metatarsal glands do not exist. Eleven cutaneous glands are present, the most conspicuous being the post-mandibular gland or "cheek patch".

Pronghorn males average approximately 120 pounds and females ten percent less. Both sexes have horns, which are shed annually. The horn sheath is attached to a bony core and is composed principally of compressed cornified epithelial cells. The base of the horn sheath is often covered with hair, which probably serves as structural support and anchorage of the sheath to the tissue between the sheath and the bone core. The horn sheaths are approximately ten inches in length for average males and are forked forming a prominent prong. The female horns are vestigial, usually two inches or less in length, not forked and sometimes totally absent. Occasionally, individuals of both sexes may display horn buds on the muzzle. These buds do not have bony cores.

The body is distinctly marked being white on the underside and rump with a triple white bow-tie pattern on the ventral side of the neck. The dorsal coloration is basically golden-brown with a strong tinge of cinnamon, especially on the mane. Males are further distinguishable by a black cheek patch and black markings on the top of the muzzle and forehead. The latter areas become increasingly darker with age. The most prominent physical feature of the pronghorn at great distances is the white rump patch. When alarmed, the guard hairs are extended vertically forming a rosette of white that can be seen for a great distance. This is a visual queue to communicate alarm within a group.

Adaptations

Pronghorn have exceptionally keen eyesight. They rely on this sense and their running ability to evade predators (Hoover, et al. op. cit.). Pronghorn are the fastest running ungulate in North America. Adults have been clocked at speeds up to 55 miles per hour and may approach 60 miles per hour for short spurts.

Figure 4. Male (standing) and female pronghorn.

Habitat Preference

Pronghorn prefer gentle rolling topography and flat prairie or tablelands. In some areas they are found utilizing the more mountainous terrain. A majority of the vegetative types used are associated with prairie grasslands. The majority of Nevada's pronghorn inhabit the cold desert shrub lands and the great basin sagebrush/grasslands habitat types. A detailed description of their habitat in Nevada is provided in the next section.

Behavior

Pronghorn are social creatures, seeking company of others and forming small groups of approximately eight to ten individuals during the summer season. Considerably larger groups of 20 or more individuals congregate during the winter season. Mature males often prefer to stay by themselves during the spring and summer seasons, while young males often form bachelor groups. Females are gregarious except when giving birth and for a short time thereafter.

Some populations of pronghorn migrate annually between summer and winter ranges. The timing of the migrations varies considerably dependent upon existing environmental conditions. Ackerly and Regier (1956) found that migratory movements of pronghorn are largely regulated by weather and ground conditions. Generally, snow depths of 10 to 12 inches will force the animals to seek more protective cover. The migrations are sometimes accomplished very rapidly. Spring migrations are generally more leisurely as the large herds break up into smaller units on their return to the summer ranges. Major movements of 100 or more miles have been recorded, however, in Nevada movements are generally less than 50 miles. Some herds do not migrate; instead they exhibit daily and seasonal movements, which are dictated by a variety of environmental and physiological factors.

Activity patterns of pronghorn change with the seasons. During the summer months active feeding occurs during the early morning and late evening hours. Watering takes place in mid-morning and evening while the great majority of the mid-day period is used for resting. An alteration of feeding and resting periods is continued throughout the night, (Buchner, 1950). During winter, herds of pronghorn may be forced to increase their range and movements to seek out native shrub types to supplant their nutritional requirements.

The breeding season commences with the rut in September. The peak of rutting activity occurs around mid-September and continues into October. A polygamous species, bucks gather their harem of 10 to 20 females depending upon the individual buck's aggressiveness and physical condition. The aggressive behavior during the rut is most evident just prior to actual breeding. Antagonism between bucks begins around July 1 - the onset of harem formation. The spirit of competition, as evidenced by fights and chases between bucks, increases in intensity from this time until the end of the breeding period (Ackerly and Regier, op. cit.).

Horn butting is seldom observed between individual buck pronghorn. However, Yoakum (1957), Spencer (1941) and Annon (1961) report incidences of injury and even death as a result of horned combat. A greater amount of time, however, is spent pawing the ground, chasing one another and rubbing horns on vegetation.

Reproduction

Female pronghorn generally mate for the first time in September of their second year. The gestation period is approximately eight months with various researchers estimating from 217 days to 252 days (McClean, 1944; Larsen, 1964; Mace, 1949; Einarsen, 1948; and Prenslow, 1965). Based on the peak of rut and subsequent peak of fawning in Nevada the gestation period is approximately 242 days. Does seek seclusion

a few days prior to parturition. Twinning is the rule and has been estimated to occur 90 percent or more of the time based on uterine examination, (Hoover, et al., 1959; Larsen, 1964). The sexes are almost evenly represented with a slight edge for males at birth. Fawns are un-spotted and beige in color. Newborn fawns weigh approximately seven pounds. Weight gain is rapid, as much as two pounds in 48 hours. Within a few minutes after birth, fawns are able to stand and nurse. By the time they are two days old they can outrun a man.

Figure 5. Pronghorn fawn in hiding posture.

HABITAT DESCRIPTION

Climate

Nevada's climate presents wide variations of temperature and rainfall. The state generally experiences plentiful bright sunshine, low annual precipitation in the valleys and deserts and considerable snowfall in the higher mountains. Much of western Nevada lies in the immediate rain shadow of the Sierra Nevada Mountain Range. This major continental massif influences precipitation regimes for most of Nevada. The majority of the State's precipitation occurs during the late fall and winter seasons in the form of snow. In the southern desert areas precipitation occurs in approximately equal quantities throughout the year. Intensive summer thundershowers can contribute to localized precipitation totals.

Average annual temperatures vary considerably throughout the state. However, hot summer daytime temperatures are common for two months a year and freezing nighttime temperatures are consistent for about three months. Deviations from these generalities relate to latitude and elevation. Because of the high altitude and the extreme dryness and clearness of the air, there is rapid nocturnal radiation of heat, resulting in wide daily ranges in temperature. Over most of the state, frosts can begin early in autumn and continue till late spring. The growing season varies from less than 100 days in the northeast to 140 days in the west and over 225 days in the extreme south (Sager, op. cit.).

Topography

John C. Fremont, following his 1843-44 expedition into Nevada and adjacent areas, first applied the term "Great Basin". The term denotes that part of the central intermountain west lying between the Rocky Mountains and the Sierra Nevada mountains, which has no drainage to the exterior (La Rivers, 1962). Topographically, this region consists of numerous parallel north-south trending, isolated mountain ranges separated by nearly level intermountain basins (Cronquist, et al., 1972). Playas are conspicuous characteristics of the landscape throughout the State. Some of the major alkali encrusted playas in the western part of the State are remnants of pluvial Lake Lahontan.

The phenomenon of "block faulting", when portions of the earth's crust move up or down, has been largely responsible for the present appearance of the Basin. Across central Nevada parallel ranges extend longitudinally from west to east. The more prominent peaks extend upwards to 10,000 feet with a few points exceeding 11,000 feet. The valley floors dip to 5,000 feet and in the southern tip of the State they extend downward to 2,500 feet or less. Because of NDOW's reestablishment programs, many of these valleys today support herds of pronghorn.

The southern extension of the Columbian Plateau enters the state across the northern border. This plateau region is generally higher in elevation with valley bottoms at elevations greater than 5,000 feet; however, the mountain peaks are generally below 10,000. It is in this plateau region that most of the remnant pronghorn populations resided prior to reestablishment efforts. In the basin and range areas pronghorn most frequently inhabit the valley and bench areas and occasionally the more mountainous regions.

Water

Water is a key component of pronghorn habitat and a necessary requirement for a productive population. Leopold (1948) and others have reported that pronghorn can exist on open ranges without available drinking water, subsisting on succulent forage. Research conducted at the Desert Experimental Range on the western Utah desert concluded that without drinking water, pronghorn could not live for extended periods during hot summer months on a salt desert shrub vegetative type even when above-average forage succulence occurs. The amount of drinking water required for pronghorns is related both to maximum air temperatures and the amount of moisture in the feed they are utilizing (Beale and Holmgren, 1975).

In Wyoming, available drinking water was found to have marked effects upon the summer distribution of pronghorn (Sundstrom, 1969). Intensive summer surveys on the Red Desert of Wyoming indicate that 95 percent of the pronghorn observed were within three miles of a water source. The study further showed that with one water source per five square miles, the average number of pronghorn per square mile was 7.1. As the number of water sources per square mile decreased, the pronghorn density correspondingly decreased. With one water source per 30 or more square miles, the average number of pronghorn per square mile decreased to only 0.5 pronghorn per square mile.

In 1983, the distribution of water in most of Nevada's northern pronghorn summer ranges met the recommended standard of one permanent source every three to five miles, Sundstrom, et al. (1973). However, at that time water in the remainder of the state was frequently deficient in distribution, permanence, and quality. Natural water sources are subject to frequent drought and heavy competition between domestic livestock, feral horses and wildlife. Artificial water devices, commonly known as "guzzlers", have been and will continue to be strategically placed throughout occupied and potential habitat in order to enhance and expand pronghorn and other wildlife populations.

Guzzler placement will be determined to mitigate for losses of natural water sources, degraded habitat and/or fragmented conditions brought about by other historic or present land management practices or uses. Guzzler locations are delineated on the maps in Appendix I.

Vegetation

(see Appendix II for taxonomic nomenclature)

The vegetal cover of the range and forest lands of Nevada is dominated by deeply rooted semi-desert shrubs, with an understory of perennial and annual grasses, a wide variety of forbs, and a few noxious or poisonous herbaceous species. The northern desert shrub vegetative type of particular importance to pronghorn is principally composed of the big sagebrush community. This is the climax seral stage of desert areas where the annual precipitation is usually greater than seven inches (Cronquist, *et al*., op. cit.).

Sagebrush communities generally occupy a narrow altitudinal belt above 5,000 feet in the south. In the north, sagebrush species occupy the broad valleys and lower foothills where the soils are deeper, more permeable and relatively saline free. Sagebrush may extend upwards to 10,000 feet in many areas. Big sagebrush is the dominant species. Low sagebrush occurs in the north and black sagebrush occurs in south-central and eastern Nevada as co-dominants with big sagebrush. Many of the big sagebrush benches and broad valley floors have been converted to farmland or cultivated pasture land and are not as widespread today as they were prior to 1950.

The majority of the pronghorn habitat in Nevada occurs in the northern desert shrub type. The low sagebrush communities of the table and bench lands are preferred habitats. The big sagebrush-pronghorn bitterbrush communities are favorite haunts of pronghorn during the summer and fall seasons. Pronghorn are widely distributed on bench lands showing preferences for communities with a mixture of sagebrush,

shadscale, forbs and grasses. In northern habitat areas the salt desert shrub type is used as winter range owing to the more favorable climatic condition at lower elevations and the presence of palatable forage.

Pronghorn inhabit piñon-juniper and juniper woodlands to a limited extent dependent upon the density of the forest canopy. The Utah juniper is the most widely distributed species and is found typically in association with the single-leaf piñon. The western juniper occurs on the plateau regions of northern Washoe County forming a woodland in association with sagebrush and other shrubs that pronghorn inhabit. In eastern Nevada the Rocky Mountain juniper occurs at select localities. An interesting ecotype of this species known as "swamp cedar" (Billings 1954) grows in the wet and saline bottom of Spring and White River valleys of White Pine County. Pronghorn inhabitant this woodland type in Spring Valley.

The southern desert shrub type occurs within Mojave Desert Biome, generally below the 37° latitude. The dominant shrub is blackbrush. Pronghorn observations dating from the settlement years are lacking in the southern part of the State. Had pronghorn populations existed before 1900 and had they been extirpated due to man's actions, then natural repatriation has yet to occur. A previous attempt to translocate pronghorn to this habitat type met with failure. Major plants found in association with this community are the yuccas, barrel cactus, chollas, and burro bush.

The mountain brush type is principally located on the uplands and slopes of the major mountain ranges of the state. Important range plants include snowberry, aspen, chokecherry, mountain mahogany, serviceberry, bitterbrush and big sagebrush. Forbs found in association with this type include balsamroot, Indian paintbrush, lupine, phlox, wyethia, and blue bell. Pronghorn can often be found in this vegetative zone during the summer.

Native grasslands, similar to those occupied by pronghorn in other states, were never well represented in Nevada. The occurrences of native grasses are associated with Nevada's shrub communities. Grass diversity, quality and quantity have all declined since settlement by European man. Decades ago, land managers converted big sagebrush benches and basins into exotic wheatgrass seedings in an attempt to increase forage for livestock. These actions were not always beneficial for pronghorn due to elimination of native forage. However, due to plant succession many of these old seedings are becoming more favorable to pronghorn and other native wildlife species. Wildfires, overgrazing and other land disturbances have resulted in the conversion of millions of acres of native habitat into stands of cheatgrass and other undesirable annuals.

The relative carrying capacities of the various habitats that pronghorn utilize in Nevada are markedly variable. The highest densities of pronghorn are found in the sagebrush-grass associations of the northern desert shrub vegetative type, with significantly fewer animals inhabiting the other vegetative types.

The descriptive summarization of optimum pronghorn habitat offered by Sundstrom, et al. (1973) and Yoakum (1980) would suggest that although Nevada's ranges appear to have sufficient amounts of preferred browse species, they lack the diversity and quantity of forbs and grasses. The stated optimum of 11 inches of precipitation would indicate that most of Nevada's pronghorn ranges are also deficient in moisture, which is reflected in the vegetative cover. The Division's re-establishment efforts have demonstrated that pronghorn are more adaptable than previously assumed.

Wildfire

Wildfire has been an ecological element for as long as plant life has flourished on this planet. Prior to the arrival of humans on the continent and their subsequent technological development, lightning was almost exclusively the ignition source for natural wildfires. It continues to be the principle cause of fires throughout Nevada today, although man-caused ignition sources have become more common.

Researchers believe that fires have occurred in random patterns over time resulting in a mosaic of vegetative seral stages that affect the biological diversity. The scale of these fires and the repetition of burning and succession are related to prevailing climatic conditions. These conditions can be short term, the result of storm intensity - lightning and wind. Long-term conditions such as successive years of drought and, conversely, successive years of above average precipitation also contribute to the intensity of wildfires. The reason for this is that all fires are dependent upon a source of fuel. In nature, organic matter from living and dead plant tissue is the fuel.

These fuel loads, more properly the volume and density of plant material, develop through natural plant growth cycles which are influenced by the type and fertility of the soil as well as current and prevailing climate. Native plant communities have evolved with fire. Their adaptations allow them to adjust to the intensity and occurrence rates of natural wildfires. By extension, animal populations dependent upon the forage provided by plants ebb and flow with plant succession.

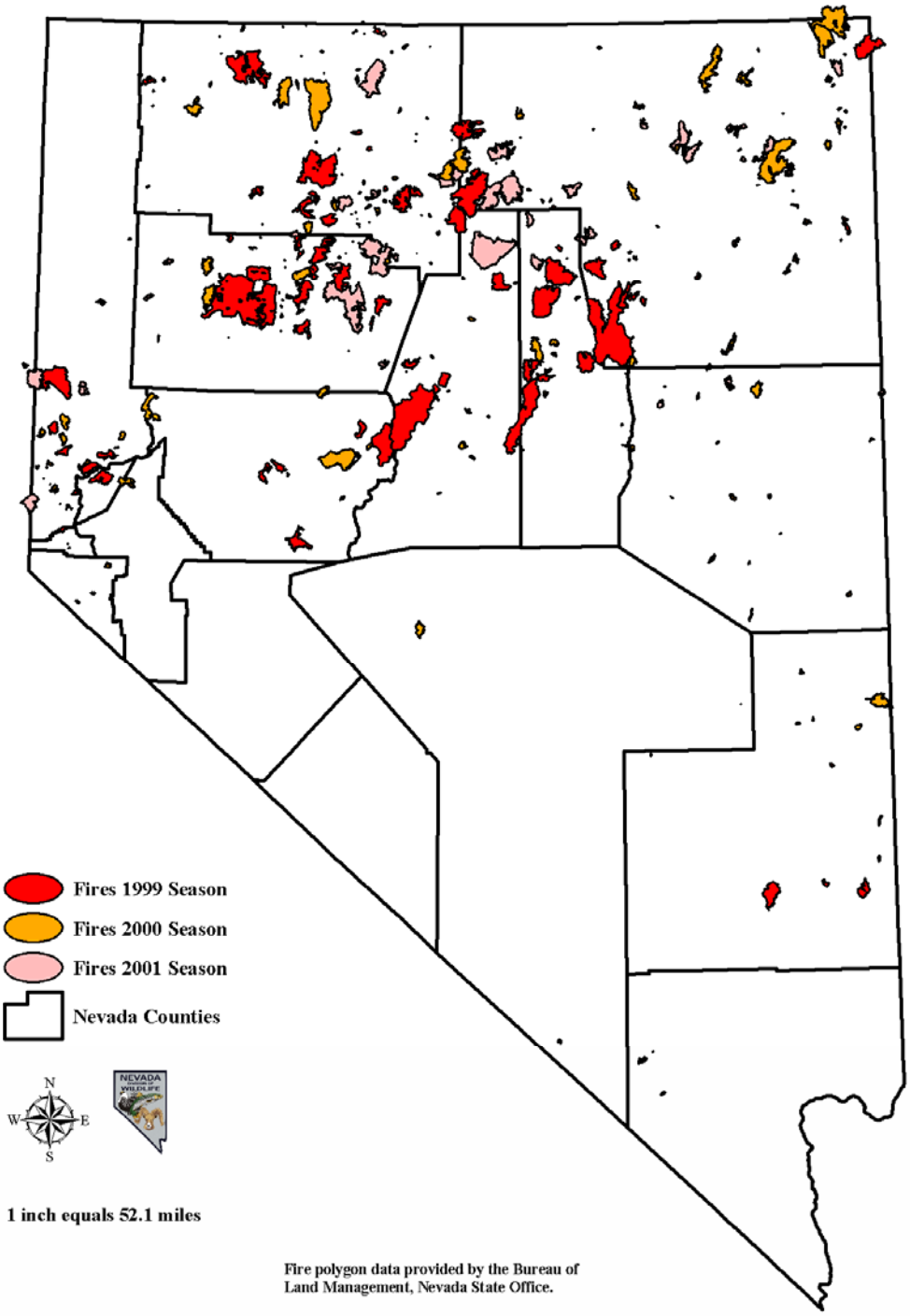
This natural coexistence continued uninterrupted until aboriginal man entered the ecosystem. Researchers of different scientific disciplines wonder about the role early man had in influencing the pattern of wildfires on the continent. Humans had the intelligence to learn how to create and control fire. Man also learned how to use fire as a tool to influence his surroundings. Almost all North American aboriginal peoples were not pastoral prior to the advent of European man, so the likelihood of using fire to influence plant succession to favor native ungulates, their food source, can only be speculated. One thing that is not speculated is the fact that native plant species naturally revegetated all burned ground prior to the appearance of modern man.

Speculation yields to documented fact when the research focuses on the impact caused by modern man. European man introduced exotic species of plants, many of which are pyrophilic - their competitive edge over other plant species, predominantly native species, is benefited by wildfire. One such species is cheatgrass, a plant of the European steppes that arrived in the pelage of domestic livestock and as packing material. This ephemeral grass germinates, sets seed and desiccates in the spring before native plants and forbs emerge. The dried matter creates a fuel load that can ignite and burn before the native plants can set seed, thus these natural components of the biome are unable to further their existence. Ultimately, broad patches of landscape have been converted to cheatgrass-dominated or even cheatgrass monotype sites.

Of greater concern to land and wildlife managers is the fact that patches of cheatgrass serve as primers of vast fires that can appreciably alter the ecosystem. Figure 6 outlines the areas burned by major fire events during the summers of 1999, 2000 and 2001. Wildfires during these three summers consumed unprecedented acreages of brushlands.

Biologists and land managers are left wondering whether the continuation of this phenomenon can be stopped. Accordingly, managers are attempting to mitigate the results of these catastrophic fires, or the intensity of future events, through the application of specific management practices. Revegetation projects on burned areas are increasingly making use of native species and some exotic species such as *kochia*; in an attempt to diversify the monotypic cheatgrass stands. Managers also plant "green strips"- patches of plant mixes that theoretically could intercept low intensity fire perimeters. Livestock turnouts are also postponed in an effort to give the land an opportunity to heal. Key habitat areas for pronghorn and other wildlife have been mapped and are now important considerations within fire suppression plans.

Figure 6. Nevada Wildfires - 1999 to 2001 Fire Seasons



Fire polygon data provided by the Bureau of Land Management, Nevada State Office.

COMPETITIVE AND CONFLICTING USES OF THE HABITAT

Agriculture

Nevada is approximately 83.5 percent federally owned. The Bureau of Land Management administers over 47,900,000 acres or 68 percent of the State's land area, while the U.S. Forest Service controls over five million acres and the Department of Defense over three million acres. The U.S. Fish and Wildlife Service has control of more than two million acres and the Bureau of Reclamation approximately one million acres. In total, agency controlled lands equals 58,700,000 acres.

Although the total land surface of the state is large, that which is used for farming is relatively small, totaling less than one million acres. Farm crops are grown primarily in support of the livestock industry, principally in the production of hay, grains and pasturage. The livestock industry has been the major agricultural activity in the state since the 1850's. Sheep, cattle and horses have had detrimental impacts to pronghorn habitat. Key pronghorn habitats were used for domestic livestock pasturage, and production of native hay crops. On his field investigation in 1902, Griffiths documented range use between Winnemucca, Nevada and Ontario, Oregon. He stated, "The public ranges of the region are in many places badly depleted and furnish at the present time (1901) not over one-third of the feed which they once did. This is directly traceable to overstocking, and it does not appear clear how matters will improve in this respect in the near future as long as there is no inducement for anyone to do ought but get all he can out of the little that the country does produce."

Spillman (1903) witnessed the problems of grazing on western ranges by livestock. He stated, "It is noteworthy that the one factor which has contributed more than any other to the depletion of the ranges is the development of hay production on irrigated land in the range region (northwestern Nevada). As long as stock was compelled to subsist the year round on the range, the limited supply of winter feed rendered it impossible to support enough stock to make serious inroads on the more abundant summer growth. The forage plants of the ranges were thus permitted to make seed. But with the advent of hay for winter-feed the amount of stock that could be handled increased until in many places the summer growth on the range was entirely consumed leaving no chance for the production of seed. As a result, many thousands of acres of land that formerly furnished abundant pasture are now devoid of any growth that stock will eat, while plants of no value have spread rapidly over these areas."

Early federal livestock grazing programs encouraged the overuse of western rangelands. As a result, native shrubs undesirable for livestock forage increased. Simultaneously there was a drastic reduction in native grasses and forbs and a significant invasion of alien weeds highly adapted to intensive grazing. The depletion of native ranges had an almost immediate adverse impact by decreasing the pronghorn range carrying capacity.

The invasion and establishment of alien weed species replaced much of the more desirable native vegetation. There was also a substantial increase in the native shrubs such as sagebrush and rabbitbrush. Although many of the weed invaders were beneficial as forage for pronghorn, they were no replacement for the native forbs.

In the semi-arid to arid intermountain zone, vegetation is relatively scant and the shrub, grass, forb community can be considered part of a climax (Wagner 1976). The change of this climax to the present alien weed community has resulted in substantial reduction in pronghorn carrying capacity.

Competition for water between livestock and pronghorn occur in localized areas of the open range. These conflicts may become acute during periods of drought. Feral horses have become serious competitors for water in some areas. These large exotic animals have created mechanical damage to many natural water sources, resulting in impaired function, diminished water quality and the elimination of peripheral vegetation. Additionally, horses act aggressively toward native ungulates, causing the latter to expend increased amounts of energy to seek alternatives to meet their water requirements.

Some livestock water developments can be both beneficial and detrimental. Development of catchments, natural seeps and springs for livestock can benefit pronghorn by providing permanent and well-distributed waters. However, water developments for livestock are also detrimental in that they support increased competition for living space and forage. In some cases the appropriation of waters from natural streams and springs by diversion through concrete ditches and pipelines for agricultural or industrial use rendered habitats unusable to pronghorn. All developments should insure that water remains available at the source. The development of new waters by drilling wells and attaching pumps or windmills for livestock use has also benefited pronghorns; however, the practice of shutting off the water source of in the absence of livestock can present serious problems to a pronghorn herd that establishes dependence upon that source.

Cropland and pasture development has played an important role in the decline of the pronghorn in Nevada as it has on the rest of the continent. The most productive habitat areas were quickly appropriated for agricultural purposes because of the presence of water and soils suitable for farming. In Nevada the amount of land that is suitable for cultivation is very limited and much is dedicated to the production of alfalfa. Although pronghorn will utilize these fields, they are not considered a key or important habitat component for the species.

Vegetal alterations on large tracts of rangelands have been practiced by the Federal land management agencies as well as by the private sector. The primary emphasis in Nevada has been to remove sagebrush by application of chemical herbicides, chaining, railing, plowing, burning, or beating. Range seedings have usually had a detrimental impact on pronghorn through conversion of sagebrush lands to large monotypic stands of exotic wheatgrasses.

Recreation

The role of recreation as a conflicting use of pronghorn habitat is not well documented, however, there are a few uses that are worthy of discussion. Since the 1980's the proliferation of off-road vehicular travel, particularly from all terrain vehicles (ATVs) has caused damage to habitat and resulted in localized instances of severe soil erosion and the resultant loss of productivity potential. As increased interest develops among people who want to observe pronghorn or pursue other recreational activities in their habitat, greater stress will be placed on the animal. These impacts may be difficult to recognize or measure.

Mining

Impacts to pronghorn by mining can result from numerous activities related to the extraction of minerals. Impacts can be either positive or negative in nature. Examples of negative impacts would be disturbance of existing habitat from exploration and mine development activities. Ore bodies have been developed in historical and current pronghorn range. Road construction, particularly during exploration, can allow greater access into areas previously inaccessible to the public. Increased public use can result in greater impacts to pronghorn. Impacts occurring during critical periods of the pronghorn's life cycle have the potential to be significant. Mine related facilities have been constructed between summer and winter ranges that restrict and sometimes eliminate traditional movement corridors used by pronghorn.

Pronghorn mortalities may occur if individuals come in contact with process solutions. Regulations promulgated by the state have made it necessary for mines to protect wildlife from these hazards. Stipulations in the Division's Industrial Artificial Pond Permit require that all solutions containing chemicals in lethal concentrations must be made inaccessible to wildlife.

Dewatering activities have the potential to impact springs and seeps used by pronghorn. If water sources are dried up or flows reduced by dewatering, these sources would no longer be available for use by pronghorn.

Acid rock drainage (ARD) has developed at some mine sites in Nevada. Exposure to solutions containing ARD could be problematic for pronghorn. State regulations are designed to ensure ARD is mediated and waters of the state are not compromised.

Positive impacts can be attributed to mine related activities as well. In some locations, reclamation of mine-related disturbances has created vegetative communities better suited for pronghorn than adjacent undisturbed vegetation. This is largely due to the plant selection in reclamation seed mixtures and the fact that livestock are excluded from most mine reclamation for several years to allow the vegetation to become successfully established. In some cases, existing habitat has been changed as a result of mine construction, creating an entirely different vegetative community than what was there originally. Depending on the plant community that becomes established, this could be beneficial for pronghorn.

Water from the reclaimed process components has the potential to be a resource for pronghorn. Depending on water quality, these water sources could be made available to pronghorn in areas where there is no naturally occurring water sources.

Other

Other conflicting uses of pronghorn habitat include the various surface disturbances resulting from development and construction of transportation corridors, transmission line corridors, pipelines and urban areas. The continued development and upgrading of freeways, highways and other road systems, with their attendant facilities, are sectioning pronghorn habitats into more constrictive units to the detriment of the species. Highway and railroad right-of-way fencing has blocked major migration routes. High-speed travel on highways and locomotives on railroads pose a continuing threat to pronghorn.

Transmission lines and pipelines corridors have altered pronghorn habitat through access road construction. In addition, high-tension wire towers provide hunting perches and nesting substrate for large raptors and corvids, which are known to prey on pronghorn fawns. With increased demands for energy, greater conflicts are anticipated.

Urban encroachment on pronghorn habitat has been minimal; however, continued growth in Nevada will dictate future impacts. Since 1970, Nevada's human population has grown from 488,738 people to its current population (July 1, 2002) of 2,197,056. The U.S. Census predicts that the state will have 3,807,312 people by the year 2020. Certainly, some adverse impacts will result from this growth in population even though major cities are not located in key or important pronghorn habitat use areas.

Habitat Potential

The quantity and quality of available pronghorn habitat will depend on the implementation of wise land management practices and use. Natural physical factors such as climatic conditions will also have a profound affect over the short term as evidenced by recent catastrophic rangeland wildfires.

Major hurdles remain in achieving prudent land use. Over the past century pronghorn habitats have been misused, altered or destroyed. A greater awareness of the public land values by the general populace has recently generated a closer evaluation of past uses and abuses. Land management agencies, notably the U.S. Forest Service, Bureau of Land Management and U.S. Fish and Wildlife Service have increased activity in land management planning. State and local governments have developed comprehensive plans for resources users. Private industry and the public have expressed greater awareness and concern in general for wildlife, and for cultural and aesthetic values of the land. Land use economics will have a great impact on land management direction. Losses from urban and industrial development are inevitable. A single achievement in land management, such as well-managed livestock grazing, could improve habitat conditions substantially and result in increases in pronghorn herd numbers. Improved management along with habitat restoration efforts should result in enhanced pronghorn habitat conditions in the future.

Figure 7. Pronghorn on winter range in Mineral County.

SPECIES INVENTORY

Population Estimates, Status and Trends

Members of the United States Biological Survey made the first recorded estimate of pronghorn numbers in Nevada. Mr. E.R. Sans, Predatory Animal Inspector, and Alexander McQueen, Supervisor of the Humboldt National Forest, provided the estimate that E.W. Nelson (op cit.) published. The 1922 pronghorn population was estimated at 4,253 in 11 areas of the State as shown in Nelson's original distribution map (Figure 3). Seton (op. cit.) reported 13,000 to 15,000 pronghorn for Nevada in 1926 and Allen (1942) estimated a population of 12,700 for the year 1939. Beginning in 1937, and continuing through 1970, the U.S. Fish and Wildlife Service compiled an annual Big Game Inventory with population estimated by species (Table 2).

These estimates are a compilation of data provided by numerous workers or agencies. In many cases the U.S. Fish and Wildlife Service annual questionnaires were not answered; therefore, estimates were carried forward from previous year's data. The difficulty in acquiring accurate population information resulted in curtailment of the inventory in 1977. These data are provided here only to demonstrate the general lack of knowledge concerning the status of pronghorn populations in the state, especially during the period prior to 1948. Unfortunately, population estimates for Nevada were derived from inefficient and or incomplete surveys, poor general knowledge of pronghorn distribution and far too frequently from guess work tempered by interviews from local residents of the area. Nevertheless, it is apparent that Nevada pronghorn populations declined since the arrival of European man during the early 1800's, with some local populations extirpated by 1920. The low point in Nevada's population seems to have been reached soon after the turn of the century (1900-1910), followed by a slow gradual increasing trend.

Table 1. Nevada pronghorn estimates compiled by the U.S. Fish & Wildlife Service prior to 1970.

Year	Estimate	Year	Estimate
1937	12,700	**1955**	3,800
1938	12,700	**1956**	3,500
1939	16,719	**1957**	3,500
1940	20,604	**1958**	3,500
1941	21,455	**1959**	3,500
1942	Not Published	**1960**	2,225
1943	20,525	**1961**	3,175
1944	Not Published	**1963**	3,000
1945	Not Published	**1963**	3,175
1946	8,700	**1964**	3,175
1947	9,000	**1965**	3,175
1948	7,000	**1966**	3,175
1949	3,500	**1967**	3,000
1950	4,265	**1968**	3,000
1951	2,074	**1969**	3,000
1952	4,013	**1970**	*3,000+
1953	4,000	1970 Last year of estimate	
1954	4,000		

The Nevada Division of Wildlife has utilized several methods to develop estimates of the state's many pronghorn populations. Early methodology involved the application of "sightibility" indices, the comparison of actual observations to expected observations under ideal circumstances. Rudimentary extrapolations were made by incorporating the biologist's best approximation of occupied habitat along with their rough calculation of the percentage of the population observed on key habitat areas, such as winter ranges. Given the behavioral traits of the species and their reaction to prevailing circumstances such as human disturbance or climatic features such as snow depth, biologists eventually acknowledged that sightibility was too dynamic and unreliable to provide a statistically valid estimate. Biologists were

further handicapped by the limitations of access and coverage. Their observations were limited to those areas where their conveyance - automobile, horseback or foot travel - was capable of taking them. Under that technology, a comprehensive understanding of seasonal distribution and the full amount of occupied range was unattainable.

Beginning as early as 1948, fixed-wing aircraft were incorporated into the Nevada Fish & Game Commission's survey strategy. Small airplanes proved to be extremely valuable in conveying an observer over far greater amounts of habitat. These efforts helped biologists to refine their understanding of pronghorn movements, key use areas and population numbers. Estimates from the latter part of that era were derived from aerial counts conducted during summer and winter seasons when pronghorn concentrated in number. Biologists believed they could make complete censuses of high-density populations using this method. In areas where a complete census was not assured, biologists used their survey data and corrected it for the approximate percentage of animals not observed. In fact this was another sightibility index that was still dependent upon the influences of prevailing environmental conditions, but now incorporated the type of aircraft used and the experience of the pilot and observer(s) as variables to integrate into the correction factor.

The process underwent a further iteration when photography was introduced as a tool to reduce error in the counts. Biologists would photograph groups from the airplane, or helicopter in later years, then later project the slides at high magnification to get a total count. They could also obtain sex data by examining head features such as horns and/or black markings that distinguished males. Fawns could be determined based upon size alone. In the early 1980s the Department of Wildlife deduced that it was observing approximately 75 percent of the state's pronghorn population using this methodology.

In an attempt to address the variability and bias inherent in this methodology, the Department began to apply a mathematical model to estimate populations based upon the measured changes-in-ratio between pre-hunt samples and post-hunt samples. This method, established by Selleck and Hart (1957) considers the change in ratios of observed bucks per 100 does and observed fawns per 100 does to be the predominant factors in population estimation. Theoretically, male ratios would have to undergo a decline between early August, the pre-hunt survey, and mid to late-September, the post-hunt survey, as a result of the hunting season. Additional data necessary to calculate a population besides harvest loss were crippling loss, illegal loss and other natural mortality. The latter three factors could not be confidently measured with any degree of reliability.

At the time, the change-in-ratio method was found to be extremely adaptable for use in estimating the larger pronghorn populations then found in northwestern Nevada. However, its utility waned when biologists attempted to use it to calculate the smaller, low-density pronghorn herds that occurred in central and eastern Nevada in those days. Harvest and observed buck ratios were so important to the model that the algebra could not work in the absence of these substantial factors. Conjecture based upon sightibility remained the only means of understanding herd dynamics for the biologists that managed these smaller populations.

In its quest to establish more statistically reliable population estimates the Division of Wildlife now uses a multi-year computer model developed by Barthelow (1999) called POP-II. The software was originally written for the Colorado Division of Wildlife but was partly adapted to accommodate Nevada's mule deer surveys. The current iteration of the model was developed for the Division to incorporate specific data inputs derived from the agency's population surveys, specifically observed ratios along with highly reliable harvest data resulting from the state's mandatory hunter return card policy. Population estimates are primarily influenced by fawn recruitment rates. A target year population can be computed only after entering recruitment inputs for several previous years. Cohorts from those years are tracked through the model using harvest records and

Table 2. Survey and estimate methods – State and Province Survey from the 2002 Pronghorn Workshop				
State / Province	**Survey Means**	**Survey Type**	**Estimate Method(s)**	**Estimate**
Alberta	Helicopter	Strip transect	Density by habitat type	18,255
Arizona	Fixed Wing	Transect	POP II	8,000
Baja Calif. Sur	Aerial/ground			205
California	Fixed Wing		Survey results	5,000-5,500
Colorado	Helo. & FW	Age & sex composition	Line, strip, modeling	54,070
Idaho	Helicopter	Quadrat		
Kansas	Fixed Wing	Line Transect	Winter counts	1,500-2,000
Montana	Fixed Wing	Transect	Trend counts	
Nebraska	FW & Ground	Line Transect	Line transect & trend	8,000
Nevada	**Helo. & Ground**	**Age & composition**	**Modeling**	**18,000**
New Mexico	Fixed Wing	Strip transect	Numbers observed	
North Dakota	Aerial	100% of selected	Index	
Oklahoma	Fixed Wing		Extrapolation	
Oregon	winter trend & summer classify		Minimum count	13.238
Saskatchewan	Fixed Wing	Line Transect	Transect	17,000
South Dakota	Aerial	Line Transect	Aerial w/ ground ratios	
Texas	Aerial & Ground	Strip and Herd	Stratified herd counts	10,892
Utah	Fixed Wing	Transect	From transect	12 – 14,000
Wyoming	FW & Ground	Line Transect	POP II w/ line transect	457,156

survival rates. Other mortality factors, such as severe winters or prolonged drought could be accounted for in the model to adjust population values to match observed ratios. Table 3 describes total statewide population estimates among the other states and provinces where the species exists in numbers great enough to justify a management program.

The Division uses population estimates to establish a number of management objectives. Quota computations are one important by-product of the procedure. There are constant developments in population management theory and practice. Biologists evaluate all options and incorporate new ones in a continuous endeavor to establish the most refined estimates possible. However, the need to apply such complexities for the purpose of quota computation warrants further counsel.

Table 3. Nevada Pronghorn Estimates	
Year	**Estimate**
1990	14,850
1991	18,500
1992	19,100
1993	15,800
1994	14,900
1995	15,600
1996	14,800
1997	14,500
1998	14,700
1999	14,500
2000	16,000
2001	17,000
2002	18,000

Future changes in quota recommendations may be accomplished independent of the estimate process, perhaps using a fusion of modifiers to influence changes from year to year.

The 1983 *Plan* indicated that Nevada had 27,482 square miles of pronghorn habitat supporting an estimated population of 9,824 pronghorn in 1980 for a density of 0.36 pronghorn per square mile. The *Plan* set a goal of 24,543 pronghorn by 2000 within that same amount of habitat for a density of 0.89 pronghorn per square mile. The 2002 actual figures in the above table depict 27, 815 square miles of occupied pronghorn habitat in Nevada with a current population estimate of 18,000. The revised density is 0.65 pronghorn per square mile. Population estimates indicate Nevada's pronghorn population has increased approximately 83% since 1980, although it fell short of predictions made in 1985 by 31%. It is believed that climate and short-term impacts from wildfire have been major limiting factors affecting pronghorn. Given a combination of successful vegetative manipulation efforts and favorable weather over the next five to ten years, it is likely Nevada's pronghorn population will achieve those original desired population levels.

Population Potential

Population trends through 1985 indicated an increase from the static levels that had been maintained during the thirty-year period from 1940-1970. Biologists predicted that pronghorn would significantly increase in the future (from 1985 to present) if certain conditions were met. Following is a discussion of those conditions that were outlined (in **bold**) and an analysis of their affect on the pronghorn population increases that have occurred since 1985 (in *italics*):

1. General improvement in overall habitat conditions.

a.) In vegetative quantity and quality. *General improvements in land management in some areas along with numerous wildfires have increased the overall quantity and quality of pronghorn habitat throughout much of the State. Many shrub communities that were of limited value to pronghorn have been converted to grass/forb communities that now favor pronghorn over mule deer. Managers will need to be diligent in addressing the effects of exotic plant species within the natural process of vegetative succession.*

b.) In improved water distribution and availability. *Throughout pronghorn habitat wildlife biologists have strategically placed guzzlers in an attempt to mitigate the decline of natural water sources and to provide waters where none previously existed. In some cases, these man made water developments are essential for reestablishing populations and increasing the range and density of other herds. Water sources that are developed with specially constructed fences that allow passage of agile native ungulates but exclude exotic cattle and horses are recommended since they only benefit wildlife. Since 1985 a significant number of water developments have been constructed for pronghorn with the Division's ambitious water development program and through the cooperation of partners including federal land managing agencies (BLM and USFS), sportsmen/conservation groups, landowners and public land grazing allotment permittees.*

2. Decrease competitive impacts for forage, water and living space from domestic livestock and feral horses and burros throughout current and historic or potential pronghorn range. *This condition was generally not done, but the BLM has removed wild horses when funding has become available. In addition, NDOW's ambitious water development program has allowed pronghorn populations to expand into new areas that had previously received limited grazing pressure.*

3. Protection of pronghorn habitat from undue encroachment by man and his attendant developments. *The Division continues to cooperate and coordinate with city, county, and state governments and land managers to minimize impacts to wildlife from negative effects of man's encroachment and development.*

4. Maintain a vigorous program of trapping and transplanting to reintroduce pronghorn onto historic ranges and new areas where conditions are favorable. *Along with the water development program, the Division's trapping and transplanting program has been and continues to be a major contributor to the enhancement of Nevada's pronghorn resource.*

It was never the intent of the Division to maximize the pronghorn resource without limitations or consideration for other multiple uses. The 1983 Pronghorn Species Management Plan established a statewide population objective of 20,000 pronghorn by the year 2000. This objective was very nearly met in 1992 when the statewide population estimate rose to 19,000. The year 2002 adult pre-hunt pronghorn estimate was 18,000 animals. The Division remains committed to managing pronghorn consistent with multiple-use management concepts adopted by the BLM and USFS and consistent with the goals and objectives outlined in federal land use plans governing management of our public lands. Neither land managers nor the Division have identified negative impacts to the vegetative resource resulting from pronghorn use.

Distribution

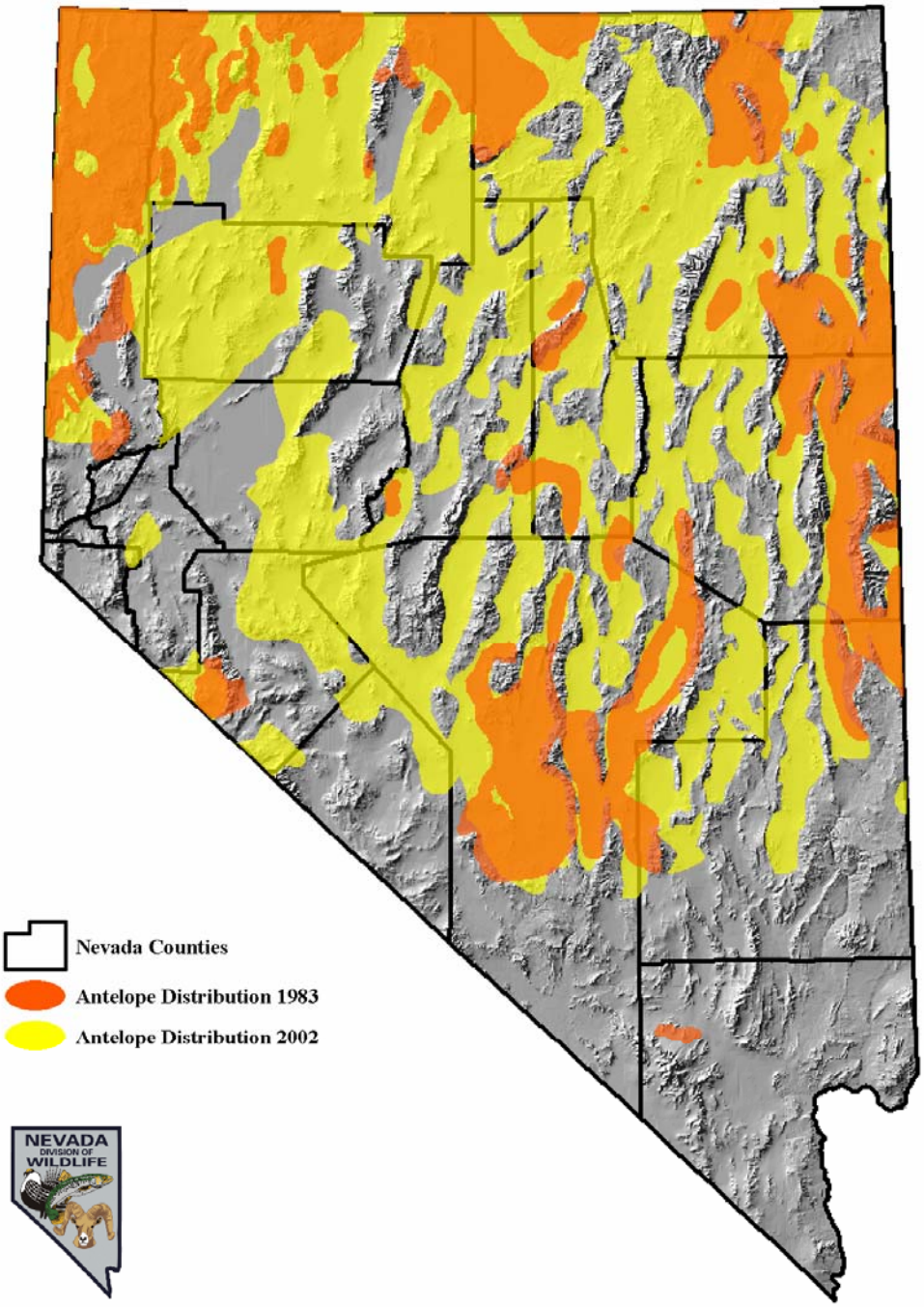
Twenty years ago, biologists projected that pronghorn occupied 21,246 square miles in Nevada (Figure 4). Presently, suitable pronghorn habitat covers approximately 55,952 square miles of the state. Prior to reestablishment efforts, distribution was limited to the northwestern and central portions of the state. Efforts to reestablish pronghorn within vacant habitat or to augment remnant populations occurred in the 1950's in several areas of the state (Appendix III). Initial translocation projects utilized donor stock from the Sheldon National Wildlife Refuge. Subsequent releases in that decade consisted of animals originating from Yellowstone National Park.

The State's translocation program really began in earnest in the 1980's. Two principle factors contributed to that change in program emphasis. Local conservation organizations were founded and these alliances cultivated significant roles as wildlife advocates, influencing government entities toward progressive management practices. They also demonstrated considerable capacity to generate the funding necessary to support these practices. Simultaneously, land management agencies, guided by contemporary changes in the law, sought to balance their approach to their resource management responsibilities. Wildlife habitat issues began to receive greater consideration where resource exploitation had formerly and traditionally garnered the most devotion.

There is still vacant habitat in the state that can support pronghorn now. In addition, habitat exists that has the potential to support pronghorn once some form of human intervention occurs. Such intervention includes creation of water sources, reduction or elimination of competing non-endemic ungulates and vegetative manipulation. The Commission meets biennially to establish a two-year plan for the translocation of big game animals in the State. Biologists propose individual projects that are incorporated into the plan. Project descriptions address all factors necessary to assure success.

Figure 8. Pronghorn from Utah being released into the Gabbs Valley Range

Figure 9. Antelope Distribution - 1983 and 2002



CURRENT AND PROJECTED RESOURCE USES

Non-consumptive Uses

Non-consumptive uses of the pronghorn resource are defined as those uses which do not consume the resource and may include such things as scientific study or aesthetic appreciation of the animal through observation. The fact that pronghorn are readily observable makes them especially attractive for non-consumptive viewing. The pronghorn also exhibits interesting behavioral traits such as their great running ability and extreme curiosity that are most appealing to the viewing public. Pronghorn have a unique historic value and are frequently associated with the pioneering era. A certain amount of romanticism is attached to pronghorn and wide-open spaces of the western rangelands they inhabit. In broader terms, public support for wildlife is demonstrated nationally by increases in expenditures for wildlife tourism and viewing and statewide by the passage of conservation initiatives Question 5 in 1990 and Question 1 in 2002.

According to the 2001 National Survey of Hunting, Fishing, and Wildlife Associated Recreation (USF&WS, 2002), wildlife observation is the leading non-consumptive use activity enjoyed by over 66 million Americans. The United States Fish & Wildlife Service estimated that 300,000 residents and 309,000 nonresidents engaged in 'wildlife watching' activities in Nevada in 2001. The values are not specific to type of activity, such as viewing or photographing. The data also do not specify the species that were specifically sought after by the participants. Scientific and educational use of the pronghorn resource is also a legitimate but an infrequent use of the resource.

Consumptive Uses

HUNTING SEASONS

Native Americans utilized this resource as opportunities presented themselves. Tribes or clans organized group hunts to capture and harvest animals. During America's western expansion, pronghorn were utilized regularly for food when available. More recently, recreational hunting has become a leading consumptive use of the resource. Regulated hunting has been conducted since 1861, when the first season was established. Appendix IV describes the history of pronghorn hunting season in Nevada. Initially, hunting seasons were liberal with a six-month open season and no bag limit. By the turn of the century season lengths and limits were reduced substantially. Since 1903, pronghorn harvest has been primarily focused on bucks.

Nevada's modern day pronghorn rifle hunts began with the 1943 season when 1,000 permits were issued for an October 10-24 hunting season. Pronghorn with horns longer than the ears were legal. Hunts have been held annually since then, with the exception of 1948, 1949, and 1952. Season dates have generally been set during the last week in August through Labor Day weekend in September for a period of nine days. By late September, physical condition declines and bucks exhibit a greater frequency of broken and shed horns and poor pelage due to recent scars obtained during the rut.

In 1959, the first special archery season was established with 50 permits available for one area in Elko County. Only pronghorn with horns longer than the ears were legal. Archery hunts have been held annually since 1967. Nonresidents were allowed to hunt pronghorn in Nevada beginning in 1967.

HUNTING DEMAND

Some measure of the demand for the pronghorn can be determined through an analysis of hunter applications. Table 5 shows the number of permits available to the hunter in relation to the total number of applicants. The expressed

demand is affected by several variables such as tag fee increases and modification of application procedures and number of available permits. Increasing numbers of Nevada residents have played a key role as has the increasing quotas afforded by the growth in the state's pronghorn population.

In an effort to accommodate pronghorn hunting opportunities among the increasing number of applicants, a successful rifle tag holder has been restricted by regulation from applying for the next five successive hunt(s). In 1954, a one-year wait period requirement was in effect. For the years 1957 through 1959 a two-year wait period was in effect for hunt areas in Washoe County only. From 1962 through 1966 a two-year wait period was in effect for all pronghorn hunts in the State.

In addition to the restrictions placed on successful tag holders for future application the party size was limited in 1958 so that no more than two persons were allowed to apply on an all go or no go basis. In 1974 the rules were changed to eliminate party applications for all pronghorn hunts.

Limited big game hunting opportunities in Nevada have resulted in the sharing of the outdoor experience. Hunting camps often develop into family or traditional friendly group outings and in many instances there may be only one tag holder in a hunting party containing ten or more people.

For many years, archery quotas were not part of calculations based on desired buck harvest. They were normally a result of negotiations between user groups and the Commission. Harvest rates for this weapon group were generally insignificant and all accepted the "add-on" status of the hunt. However, some individuals vocalized their discontent about the

TABLE 4. Hunting Demand for Buck Pronghorn Expressed by Nevada Residents

YEAR	ANY LEGAL WEAPON			ARCHERY		
	#APPs	QUOTA	DRAW ODDS	#APPs	QUOTA	DRAW ODDS
1982	3,762	545	7 to 1	241	200	1 to 1
1983	3,688	611	6 to 1	262	200	1 to 1
1984	3,702	557	7 to 1	259	200	1 to 1
1984	3,779	514	7 to 1	237	200	1 to 1
1985	3,898	687	6 to 1	244	200	1 to 1
1986	4,118	772	5 to 1	278	200	1 to 1
1987	4,413	798	6 to 1	274	192	1 to 1
1988	4,498	1,010	4 to 1	273	195	1 to 1
1989	4,281	1,013	4 to 1	309	192	2 to 1
1990	4,754	1,187	4 to 1	340	186	2 to 1
1991	5,443	1,449	4 to 1	457	243	2 to 1
1992	4,827	1,494	3 to 1	424	250	2 to 1
1993	5,085	1,183	4 to 1	431	187	2 to 1
1994	5,458	1,058	5 to 1	426	169	3 to 1
1995	6,296	1,083	6 to 1	441	172	3 to 1
1996	6,551	979	7 to 1	413	156	3 to 1
1997	6,686	932	7 to 1	391	112	3 to 1
1998	7,513	1,072	7 to 1	431	125	3 to 1
1999	8,128	1,157	7 to 1	407	140	3 to 1
2000	8,024	1,237	6 to 1	447	193	2 to 1
2001	8,246	1,085	8 to 1	743	184	4 to 1
2002	9,252	1,166	8 to 1	710	286	2 to 1

inequitable hunting opportunity potential between rifle hunters and archers. Their opinions progressed to the point that it became a contentious issue. At the same time, archers were evolving their hunting strategy and equipment to the point that they began to remove bucks in numbers that some believed to be high enough to warrant greater accountability. In an attempt to assuage this controversy, the Commission in 1991 incorporated a "demand/success" formula into the quota computation process. Described within Commission Policy quota computations are now derived from mathematical computations that incorporate expressed demand based upon application rates of the two weapons groups for the previous year and their respective average hunter success rates for the previous three years. This approach has thus far been satisfactory for Nevada's pronghorn hunters.
Over 43,000 pronghorn hunters have enjoyed relatively high harvest success, averaging 60 percent since 1943 (Appendix V). During the 1970's success averaged 81.7 percent compared to 55 percent during the 1950's. The most recent (2001) statewide hunter success for rifle hunters was 82%, illustrating that Nevada continues to maintain the high rate of hunter success first achieved in the 1970's

HUNTER EFFORT and SATISFACTION
Long-term data gleaned from hunter return cards indicate that pronghorn hunters have averaged 2.47 days afield (all hunts/all hunters). If this value were to be applied to the 43,093 hunters who actually hunted since 1943, an expanded total of over 291 years has been spent hunting pronghorn in Nevada through 2002. Table 7 compares general season hunter effort values among big game species in Nevada. Although the comparison is only between two different years, the trend for pronghorn hunter days is relatively stable over the long-term. Slight annual fluctuations are more common for archers than for rifle hunters since their hunting strategies are more greatly influenced by the weather.

Low hunter effort expended by the average hunter is a good indication of hunter satisfaction. The comparison of hunter effort with other big game hunting in Nevada shows pronghorn hunters are the most successful with the least amount of effort expended.

Hunter satisfaction is difficult to assess or measure due to individual preferences and ideologies. In the most liberal sense hunter satisfaction can be met by simply providing the opportunity to hunt. In general, however, a satisfactory hunt implies success. The highest degree of satisfaction perhaps is the cumulative sum of all the qualities, (opportunity, success, trophy quality, low effort, etc.) adding up to a gratifying and memorable experience. Expressed in this context, it would appear that hunter satisfaction in Nevada rates high for pronghorn hunters.

Table 5. Comparison of effort reported by Nevada rifle hunters in 1997 and 2002 for major big game species.

Species	Avg. Hunter Days		% Success	
	1977	2001	1977	2001
Mule Deer	4.5	4.8	43	39
Pronghorn	2.2	2.3	86	82
Desert Bighorn	8.2	5.5	70	86
CA Bighorn	-	5.0	-	91
Rocky Bighorn	-	5.7	-	67
Elk	4.2	6.4	70	69
Mtn. Goat	-	5.7	-	95

Illegal Hunting

In Nevada the poaching of a pronghorn is classified as a gross misdemeanor crime. In addition, State law provides for civil penalties and equipment forfeiture. The maximum penalties available would be a $2,000.00 criminal fine, six months jail time, $5,000.00 civil penalty, forfeiture of all equipment used to commit the crime, including vehicles and revocation of license privileges. However, the courts rarely impose maximum penalties.

Game wardens believe the detection rate for pronghorn poaching is lower than that for elk and deer. Several poaching studies have been conducted throughout North America. These

studies all indicate that game wardens discover a very low percentage of the animals that are actually poached. One study conducted in New Mexico indicated discovery rates for poached big game may be as low as 1-2 percent. The number of pronghorn poachings detected by Nevada's game wardens is believed to be very low. The Division cannot say with certainty that fewer pronghorn are poached compared to other big game species. However, records do suggest that this may be the case. Wardens believe detection rates for pronghorn poaching are lower than those for deer and elk.

Pronghorn are prevalent throughout much of the state. They are often seen within close proximity of highways. They are curious animals. Once killed, even an un-gutted pronghorn can be quickly and easily loaded into a vehicle, leaving little evidence behind. All these factors help facilitate the poaching of pronghorn and make these poachings more difficult to detect. The Division lacks any records that document instances where the criminal only took the head and left the meat to rot. This *modus operandi* appears to be more popular with deer and elk poachers. A larger percentage of pronghorn poachings appear to be crimes of opportunity whereas other big game poachings may be more premeditated.

Division records demonstrate that an overall downward trend in documented pronghorn poachings has occurred. This may indicate that poaching of pronghorn is actually decreasing or this may be a result of other factors, including diminished field patrols by game wardens. Regardless of the data or its interpretation one thing is for certain: public participation in programs such as Operation Game Thief are effective tools in deterring and apprehending poachers.

Figure 10. A young sportsman enjoys the success of his first pronghorn hunt.

Educational and Scientific Use

Infrequently researchers consumptively use the pronghorn resource in order to collect samples from animals for detailed studies. Collections have also been made for purposes of preserving specimens for educational and scientific use by schools and museums.

ECONOMIC VALUE

The economic values of pronghorn are classified as recreational, aesthetic, educational, biological, social and commercial, (King, (Stienhoff, H.W.) 1978). Many of these aesthetic and social values are very difficult to measure in terms of monetary worth. In Nevada, few studies have been done to measure the economic values of wildlife. Garrett (1970) analyzed the characteristics of the mule deer hunter in Nevada and mentioned some other big game hunting values including pronghorn. Kay (1988) presented the results of his study *Survey Of The Economic Value Of Trophy Big Game And Deer Harvest 1984 through 1986.* The economic values of the pronghorn in Nevada are presented in the following discussion from two broad categories; consumptive and non-consumptive recreational uses using the results of Kay's study.

Consumptive Values

The determination of consumptive value requires knowledge of harvest statistics, mainly the number of hunters participating, the number of days spent hunting and the average expenditures of funds in pursuit of the hunting activity. Garrett (op. cit.) reported that in 1967, pronghorn hunters spent an average of $55.32 per trip excluding hunting license and tags. If Garrett's original data were updated using the consumer price index (CPI) to adjust the annual increases in cost, the value would be $236.46 per pronghorn hunting trip in 2002. With the addition of the hunting license, tag and application fees and the estimated amount spent on taxidermy from the original pronghorn species plan, the total cost of single trip would increase to $675.72 for residents and $962.72 for nonresidents.

Kay's study was much more encompassing than Garrett's and included all reported costs associated with big game hunting including tags, licenses, guide fees, equipment, scouting trips, taxidermy, gas, food, ammunition, lodging, etc. Using Kay's study for comparison and taking into consideration the CPI, the current amount that would be expected to be spent by 2002 pronghorn tag holders would be $772.62. The 1,333 buck hunters participating were calculated to have spent $1,029,902.40 to hunt pronghorn in 2001. These figures are conservative because they include 64 nonresident hunters who have been shown to expend 70% more than residents on big game hunts in Nevada (Kay 1988).

Successful hunters are also rewarded with the meat of the animal taken. It is estimated that the average buck pronghorn provides 36 pounds of boneless meat that can be consumed, Schmidt (1978). Using the 2001 retail value of $2.89 per pound for ground chuck beef the pronghorn meat obtained during the 2001 season was worth $116,940.96. The sum total of the measured consumptive values from pronghorn harvested in 2001 equaled $1,146,843.30.

Non-consumptive Values

Non-consumptive uses are those activities that rely on the presence of a resource for recreational or educational enjoyment without removing that resource. In Nevada, the non-consumptive values for pronghorn would include such activities as observation, photography, scientific study, etc. A measure of the non-consumptive values is more difficult to obtain in Nevada since little data has been collected. Using Kay's study and adjusting for the CPI, it was calculated that a minimum of 3,504 non-consumptive user days were spent in association with the hunting season by participants who were not tag holders. Those non-consumptive users spent a minimum of $186,480.39. It can be estimated that many tens of thousands of dollars are spent in addition to these by non-consumptive viewers and photographers of pronghorn throughout the year.

The preceding exercise in calculating the economic benefits and monetary value of the pronghorn resource clearly demonstrates that wildlife provides values comparable to other commerce and industry and is a significant use of the basic land resource. It is important that the wildlife manager collects and maintains basic resource data so that economic values can be fully identified and measured. Only in this way can the wildlife resource compete in the political, commercial and industrial arena relative to proper and best management of the habitat that wildlife depends upon.

Figure 11. Pronghorn group in full stride.

SPECIES MANAGEMENT

Past Management Practices

The following summarizes actions placed into affect for the purpose of pronghorn management specifically, or for big game management in general. These actions are listed in chronological order.

Nov. 2, 1861 - Management of the pronghorn in Nevada had its earliest beginnings on November 2, 1861 when the Territorial Legislature passed an act relating to wild game and fish with provisions for the complete protection of pronghorn and other big game animals between January 1 and July 1 of each year.
1901-1902 - Closed season - pronghorn were fully protected.
1903-1908 - Open season for two months, males only with a limit of three animals.
1909-1916 - Open season, however, by 1916 the limit was reduced to one animal.
1917-1920 - Closed season.
1921-1922 - Open season, however, the County Board of Supervisors in Washoe County established a season for one half hour from 7:30-8:00 a.m., November 10. (Shortest season on record.)
1923 - Closed season through 1942. Establishment of State Wildlife Preserves for the protection of all wildlife but primarily pronghorn and sage hen.
1924 - Predator control on pronghorn ranges was initiated. A restocking experiment (raising pronghorn fawns for transplant) was conducted by the U.S. Biological Survey. First census of pronghorn conducted by Biological Survey, E.R. Sans.
1934 - Creation of the Charles Sheldon Pronghorn Refuge.
1936 - Withdrawal of 536,956 acres to create the Charles Sheldon Pronghorn Range.
1937 - Passage of the Pittman-Robertson Act for Federal Aid in Wildlife Restoration.
1943 - Hunting seasons re-established, marking the beginning of recent pronghorn hunting. Hunt established as a depredation hunt to alleviate alleged range over grazing.
1947 - The Nevada Fish and Game Commission reorganized to form a 17-man commission and a five man executive board. Nevada finally qualifies for Pittman-Robertson Federal Aid in Wildlife Restoration funds.
1948 - First aerial census of pronghorn.
1949 - Formation of the Four State Pronghorn Conference later called the Interstate Pronghorn Conference. Intensive aerial census of northwestern Nevada pronghorn areas was initiated in a cooperative inventory effort with California, Oregon, and Idaho.
1950- A trapping and transplant program was initiated. First release stock captured at Sheldon NWR. Program begins in earnest in 1984.
1955-1957 - Pronghorn mortality and movement studies conducted in northern Washoe County.
1957 - Introduction of the tag return card to monitor harvest and hunter effort.
1962 - Pronghorn Management Guidelines developed and published, Griffith (1962).
1964 - Refinement of pronghorn distribution mapping in the State. Formulated the statewide pronghorn summer production surveys.
1967 - The Sheldon National Pronghorn Range opened to controlled hunting of pronghorn.
1967 - First archery seasons
1969 - Pronghorn considered a "trophy" species and managed to emphasize quality rather than quantity. Tag fee was increased accordingly.
1978 - First use of a helicopter for population surveys.
1983 – Pronghorn Species Management Plan published.
1984 – Nonresident quotas established. Limited to Sheldon NWR in this initial year.
1992 – Nevada Legislature creates NRS 502.145, which enacts the Deer and Pronghorn Landowner Damage Compensation Program.
1999 – Nevada record buck scoring 93 2/8 Boone & Crockett points shot in Unit 012.
2001 – All pronghorn estimates derived by POP-II
2001 – All pronghorn quotas determined through demand success formula for all units.
2002 – Pronghorn hunts are authorized for 30 Unit Groups.

Current Management Practices

Management of pronghorn prior to 1943 was focused primarily upon harvest programs, which were justified by little or no biological data. Since that time, considerable knowledge has been gained and more accurate information is now available to help make sound management decisions.

The objective of pronghorn management in Nevada is to protect, maintain or increase the resource for the enjoyment and use by the people now and in the future. To this end the following management practices are maintained annually to determine the status and trend of the pronghorn resource and its attendant habitat.

Determining Herd Status and Trend

The Division utilizes two data sets to determine the status and trend of the state's pronghorn populations.

1. Population Sampling

Biologists collect composition samples of individual populations through formal and sometimes opportunistic survey efforts.

The composition data reveal to the biologist important population characteristics such as male to female ratios and fawn production and recruitment. Both sets of information are incorporated into the population estimate process. Formal surveys are scheduled attempts to locate and classify groups of pronghorn within specific geographic areas where they are anticipated to occur.

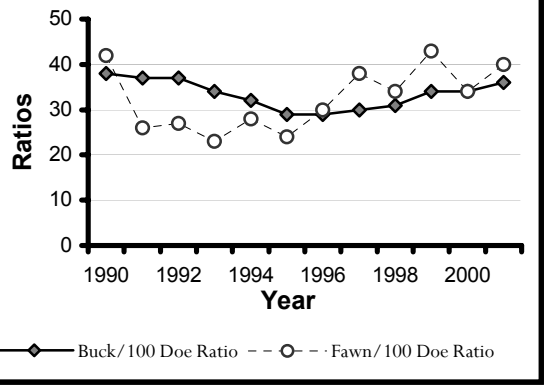
These surveys are often accomplished with the use of a helicopter in order to cover large amounts of terrain. Surveys are also conducted on the ground in those areas where biologists believe they can observe a sufficient number of animals to comprise a representative sample of the populations' sex ratio and fawn production. Surveys are usually conducted at times of the year when the herds are concentrated, thus biologists can efficiently classify representative samples. Some of these surveys occur after hunting seasons have concluded while others occur during the winter.

Opportunistic samples are obtained when biologists are conducting other field activities and encounter numbers of pronghorn that can yield good composition data. Examples include pronghorn classified while conducting landowner compensation tag investigations and pronghorn observed while conducting other species surveys.

2. Harvest Data

All hunters are mandated to provide information about their hunt to the Division through hunter return cards. These data can provide some gross revelations about the status of the population. Hunter effort and hunter success rates can imply buck availability, and by extrapolation population density and distribution. Comparisons of reported buck kill to harvest objectives can serve as test of the biologist's predictions. However, harvest results can often be influenced by the prevailing climate, wildfire, hunter distribution patterns and other natural or human-caused factors that are out of the Division's control. Furthermore, hunt quotas have been so conservative that high hunter success rates are normal thus diminishing their reliability as an indicator of buck availability.

Figure 12. Nevada Pronghorn Buck/Doe/Fawn Ratios: 1990-2001



Population Estimation

The process of creating population estimates is explained in the *SPECIES INVENTORY* section of this plan. Every spring, biologists generate pronghorn population estimates using the data they collected on their surveys along with the harvest data provided by hunters. These values are then used to construct management recommendations, including proposed quotas. All population estimates are published within the Division's annual Big Game Status reports.

Determining Distribution and Movements

It is imperative that knowledge of animal distribution and movement be understood thoroughly so that management by herd unit can be accomplished. Herd composition surveys provide an excellent opportunity to record seasonal distribution limits and migration routes under a variety of climatic conditions that vary from year to year. Documented sight records emphasize the importance of various segments of the overall pronghorn range and identify "key" habitat areas. These data can then be used by the public land management agencies for land planning with appropriate wildlife input to meet the needs of the resource.

Harvest Data Collection

The tag return questionnaire is the primary method used to tabulate hunter harvest and effort. The return card requests information on total hunter effort (hunter days), whether successful or unsuccessful, and date of kill. By Wildlife Commission regulation, "the return card questionnaire issued as part of a tag must be properly completed and returned to the Division of Wildlife no later than January 31, following the close of the season to which the tag applies." Any person failing to return the questionnaire within the period specified, or who submits incomplete or false information on the questionnaire will be denied all big game tags for one year." The Commission later established a regulation that allows a hunter to reinstate his eligibility with the payment of a $50 penalty. Hunters have complied exceptionally well with the regulatory requirement. To achieve this degree of compliance, a follow-up reminder is mailed 15 days following the season and second reminder sent approximately 30 days later.

Habitat Monitoring

Habitat monitoring is an essential management program that requires constant surveillance in cooperation with public land management agencies. Over 90 percent of pronghorn habitat exists on land administered by these agencies, particularly the Bureau of Land Management. This monitoring and evaluation process requires that the wildlife manager have a comprehensive understanding of the habitat requirements of the species being managed. Annual coordination meetings are held with the land agencies to exchange information on land management practices, conflicting resource uses and cooperative habitat management projects. Where conflicts arise, recommendations are submitted which provide for specific alternatives including no action. More serious conflicts may require greater coordination, mitigation, or compromise. In all cases the Division will continually monitor and interpret the habitat condition in both quantitative and qualitative terms to assure that pronghorn needs are met.

A greater awareness of the wildlife resource on public lands has been generated with the passage of the Multiple Use and Sustained Yield Act of 1963. The implementation of multiple use concepts over dominant use is sometimes difficult and continues to incite controversy in public land management. When pronghorn are placed in a position subservient to the dominance of other uses, based solely on the economics of use, then the species is in jeopardy.

The passage of the National Environmental Policy Act (NEPA) of 1969 lends further support for the protection of wildlife and wildlife habitat. NEPA requires the preparation of an Environmental Analysis report to determine impacts of any proposed federal action on the environment. Where significant impacts are apparent a more detailed

Environmental Impact Statement is mandated to further analyze the proposed action and recommended alternatives or mitigation before the action is sanctioned.

The wildlife manager also has the opportunity to recommend to the land management agencies various activities that would be beneficial to pronghorn habitat. For example, a livestock water development project may be recommended for relocation to assure maximum benefit for livestock as well as wildlife. On occasion cooperatively funded projects between the land management agencies, conservation organizations and the Division are accomplished. These cooperative projects require a great deal of coordination to assure success.

The habitat-monitoring program of the Division addresses three basic components of the habitat, which are recognized as critical to the maintenance and welfare of the pronghorn. They include water, vegetation and land surface.

1. Water Development

Throughout Nevada, water is in short supply. Today more than ever, waters are being appropriated for agricultural, domestic, industrial and urban uses, all of which compete with the needs of wildlife. Past experiences have seen entire sources tapped and diverted far away for use without a thought for the existing and historical needs of wildlife. The Division conducts continual documentation and evaluation of proposed surface and underground water appropriations. Where conflicts are recognized, protests are filed on water right applications and or developments and are submitted to the State Water Resources Division. Improper developments that ignore the needs of pronghorn and other wildlife on public land are referred to the proper land management agency for rectification.

In order to fill voids in water distribution, the Division, in cooperation with the land management agencies and sportsmen & conservation organizations, has implemented an ambitious water development program that provides rainwater catchments and storage devices, commonly referred to as guzzlers. These efforts have been essential to the expansion of pronghorn into otherwise un-suitable ranges. Division biologists will work with public land grazing permittees in identifying strategic water source placement.

2. Vegetation Monitoring

Vegetative responses to annual climatic conditions are often dramatic, however, long-term changes are more subtle and require sophisticated means of measuring condition and trend. The US Forest Service and Bureau of Land Management collect range condition and trend data through a variety of methods. Methodology is outlined within the *Nevada Rangeland Task Force Monitoring Handbook.*

The data thus collected is used to determine problem areas where competition is severe, or where range condition and trend is downward and where natural disasters such as wild fire, disease or insects have damaged the vegetative resource. Particular emphasis is placed on monitoring the use of the range by large ungulates, both domestic and wild.

Food habit studies provide an insight into the forage types and species utilized by pronghorns. Most often this information has been collected through rumen analysis or feeding observation records. Rumens used in food habits studies have been obtained primarily from hunter killed animals and scientific collections. A few have been retrieved from road kills, predator kills and other incidental sources. Appendix VI lists the species of plants utilized by pronghorn in Nevada and adjacent states. Although no importance rating is placed on the species listed, its presence in the pronghorn diet can be helpful to the range manager for habitat monitoring and range management decision-making.

3. Land Surface Alteration

The land surface may be altered by a variety of natural and man-made causes that require monitoring. The construction of highways, fences, mining, transmission lines, pipelines and other infrastructure could have a deleterious effect on the usefulness of a habitat area to pronghorn.

Fencing, in particular, has been a major problem in restricting pronghorn movements in Wyoming, Spillett, and *et.al.* (1967). Pronghorn normally pass under fences rather than jump over them. In Nevada, the problem is ever present, especially with rangeland and highway right-of-way fencing. Land management agencies have incorporated more fencing into modern grazing systems. Fencing remains a major concern to pronghorn managers.

The Division has coordinated with land management agencies and Nevada's Department of Transportation to develop wildlife-friendly construction specifications that will minimize impacts to pronghorn movement. Fences designed to accommodate pronghorn movement have a smooth bottom wire that is at least 16 inches above ground.

Changes in the land surface from whatever cause, natural or man-made, can potentially decrease pronghorn habitat. It is imperative that a close monitoring program be maintained since most of the changes are cumulative and permanent.

Hunting Season Recommendations

One of the most important end results of the pronghorn management program is to determine the annual status and trends of populations in the state and to provide for hunting opportunity when a surplus of animals exists.

The season setting process begins with the establishment of season dates on a biennial basis. Division biologists craft recommendations in accordance with management program strategies. They are also guided by their own assessments of harvest data and population trends. These proposals are then considered by NDOW staff for principles such as standardization, conflicting dates with other hunts and statewide management objectives. The Division's recommendations are then formalized, printed and distributed for public review in the form of a compiled report. This report is published on the Division's website and hard copies are distributed to members of the County Advisory Boards to Manage Wildlife (CABs). The CABs advertise and conduct public meetings to discuss the Division's proposed recommendations. The CABs either offer concurrence or submit their own alternatives. Division representatives attend these public meetings to explain the hunting season recommendations and to answer any questions relative to the biological findings. After all CABs have met, the State Board of Wildlife Commissioners convenes to consider public and agency recommendations in order to adopt hunting seasons and regulations.

In the spring of each year, NDOW biologists again assess their data to prepare population estimates. These estimates are used to establish objectives for that year only. Commission policies are then applied to the raw harvest objective in order to fairly distribute hunting opportunity the various weapons groups and to nonresidents. The public review process described in the previous paragraph is applied again and the Commission adopts harvest quotas for each hunt unit.

Special hunt opportunities are afforded through the Landowner Damage Compensation, Partnership in Wildlife and Heritage Tag programs. Quotas for these hunts are established through separate Commission policy; however, they are codified only after the public review process has been completed.

POPULATION POTENTIAL

Division biologists continue to monitor the trends of the pronghorn herds for which they are responsible. With their years of individual experience, combined with the collective experiences of their predecessors, these biologists understand the capacity of the occupied habitat to support pronghorn. Additionally, these people have a developed an appreciation of those combinations of elements that comprise potential habitat. Biologists use their data and experience to assess pronghorn population trends.

Biologists can apply these attributes to envision a herd's potential to expand in number and distribution. Table 6 depicts the potential population levels of individual herds throughout the state. These figures do not represent individual herd objectives, an idea that was forwarded in the initial *Plan,* rather, they represent likely capacity figures projected into the future.

Division biologists recognize the inherent problems associated with the development of herd estimates. This is exacerbated when attempting to make estimates for the future. It is acknowledged that unforeseen variables such as significant climatic events, wildfire, disease and political changes can influence a population to the point that the stated potential cannot be achieved. Their predictions are based upon their knowledge of existing habitat conditions considered along with the expected population benefits derived through planned and potential habitat improvements.

Projections are documented as ranges, rather than a single numerical value. To report otherwise would be folly, for ecosystems are dynamic and are thus not entirely predictable.

Table 6. Pronghorn Population Potential			
Population Name	**Unit(s)**	**Adult Population Size**	
		Current	**Potential**
North Washoe	011-015	3,325	4,250 – 5,800
Sheldon NWR	033	825	1,050 – 1,425
South Washoe	021, 022	250	250 – 350
Montana Mtns/Kings River	031	950	1,000 – 1,300
Humboldt County	032, 034, 035	1,750	1,800 – 2,400
Western Pershing County	041, 042	950	1,450 – 1,950
Eastern Pershing County	043, 044, 182	50	250 – 350
Owyhee Desert	051	600	1,000 – 1,400
North Fork Humboldt	061-064, 071, 073	950	750 - 1,000
Pinion-Sulphur Spr. Range	065	150	275 – 375
Owyhee Desert	066	150	350 – 450
Rock Creek	067-068	850	600 – 800
North Central Elko	072, 074, 075	800	1,000 – 1,400
Northeast Elko	076, 077, 079, 081	500	750 - 1,050
SE Elko / Central White Pine	078, 105-107, 121	1,000	900 - 1,200
So. Central Elko / NW White Pine	101-104, 108	550	650 – 900
Eastern White Pine	111-114	1,500	1,400 – 1,900
Lincoln / South White Pine	115, 231	475	475 – 625
Central Nevada	131,145,161-164	975	800 - 1,100
White River / Railroad Valley	132-134, 245	350	350 – 450
Eastern Lander / Eureka	141,143,152,154,155	250	275 – 375
Northwest Nye	171-173	125	225 – 300
Churchill County	181 - 184	150	175 – 250
Bodie-Wassuk Interstate	202, 204	175	150 – 200
Gabbs Valley Range / Basalt	205 / 206	200	200 – 300
Pinenut	203 / 291	100	200- 250
Lincoln / S. White Pine	221-223, 241	175	200 – 300
Central Nye	251	225	225 – 300
Current Population Total:		**18,350**	
Total Potential Statewide Population Range:		**21,000 - 28,500**	

CONCLUSION

Pronghorn are a distinct and integral part of the wildlife scene in Nevada. They have played an important role in Nevada history and have survived the changes brought about by man's ever increasing activities. This bulletin was designed to provide the reader with a basic understanding of the pronghorn and its habitat. It also serves to describe a compilation of programs that have been established for the protection, use and enjoyment of this unique resource by the people of the State.

The prospects for the future look encouraging so long as advancements in wildlife management technology keep pace with a rapidly changing society that will hopefully continue to be sympathetic to the welfare of the species. Equipped with the knowledge conveyed by this document, readers can become important advocates to ensure that welfare.

Commission policies and management goals, objectives and strategies described in the companion document *Nevada's Pronghorn Antelope Species Management Plan* will provide the overall direction for management and administration of the resource by the Division of Wildlife.

BIBLIOGRAPHY

Ackerly, W. F., and V. Regier. 1956. Northeastern California Antelope Studies. California Department of Fish and Game Progress Report. 44 pp.

Allen, G. M. 1942. Extinct and Vanishing Mammals of the Western Hemisphere With the Marine Species of All the Oceans. American Commission on Interstate Wildlife Protection, Intelligence Planning Co., Lancaster, Pennsylvania. Special Bulletin No. 11. 620 pp.

Allred, B. W. 1970. The Public Land Study of the Forage Resource. *In* What's Ahead for Our Public Lands? Natural Resources Council of America. Edited by H. K. Pyles, Washington, D.C. 169 pp.

Anonymous. 1961. Death Struggle. Wyoming Wildlife 25:15.

Baker, A. III, N. L. Archbold, and W. J. Stoll. 1973. Water for Nevada, Forecast for the Future – Mining. State of Nevada-Water Planning Report. State Engineer's Office and Nevada Bureau of Mines, Report No. 4.

Bartholow, J. POP-II, Version 1. Fossil Creek Software, Fort Collins, Colorado. 49 pp.

Beale, D. M., and A. D. Smith. 1967. Immobilization of Pronghorn Antelope With Succinylcholine Chloride. Journal of Wildlife Management 31:840-842.

Beale, D. M., and A. D. Smith. 1970. Forage Use, Water Consumption, and Productivity of Pronghorn Antelope in Western Utah. Journal of Wildlife Management 34:570-582.

Beale, D. M, and R. C. Holmgren. 1975. Water Requirements for Pronghorn Antelope Fawn Survival and Growth, Final Report. Federal Aid Project W-65-R-D-23, Job B-4. Utah Division of Wildlife Resources. 27 pp.

Beetle, A. A. 1960. A Study of Sagebrush. The Section Tridentatae of Artemesia. Agriculture Experiment Station, University of Wyoming, Laramie. Bulletin No. 368. 83 pp.

Berklund, C. 1974. Final Environmental Impact Statement. Livestock Grazing Management on Natural Resource Lands. USDI-BLM.

Billings, W. D. 1954. Nevada Trees, Second Edition. Agriculture Extension Service. University of Nevada, Reno. Bulletin No. 94.

Branzel, L. 1977. Personal Communication. USDI-BLM, Nevada State Office.

Buechner, H. K. 1950. Life History, Ecology, and Range Use of the Pronghorn in Trans-Pecos, Texas. American Midland Naturalist 43:257-354.

Caughley, G. 1977. Analysis of Vertebrate Populations. John Wiley and Sons, New York. 234 pp.

Cronquist, A., A. H. Holmgren, N. H. Holmgren, and J. L. Reveal. 1972. Intermountain Flora-Vascular Plants of the Intermountain West, U.S.A., Vol. 1. Hafner-Publishing Co., Inc., New York.

Dow, S. A., Jr. 1952. An Evaluation of Some Criteria for Age Determination of the Pronghorn (*Antilocapra americana* Ord). M.S. Thesis, Montana State University, Missoula. 71 pp.

Dow, S. A., Jr. , and P. L. Wright. 1962. Changes in Mandibular Dentition Associated With Age in Pronghorn Antelope. Journal of Wildlife Management 26:1-18.

Einarsen, A. S. 1948. The Pronghorn Antelope and Its Management. Wildlife Management Institute, Washington, D.C. 235 pp.

Ferrel, C. M., and H. R. Leach. 1950. Food Habits of the Pronghorn Antelope of California. California Fish and Game Commission 36:21-26.

Fautin, R. W. 1946. Biotic Communities of the Northern Desert Shrub Biome in Western Utah. Ecological Monographs 16:251-310.

Ferris, R. Personal Communication. USDI-BLM State Office.

Foree, W. 1955. Census and Herd Classification. Annual Completion Report. Federal Aid in Wildlife Restoration Project W-18-R-1, Work Plan No. 4, Job. No. 1.

Fremont, J. C. 1845. Report of the Exploring Expeditions to the Rocky Mountains in the Year 1842, and to Oregon and Northern California in Years 1843-44. Washington, D.C. 693 pp.

Garrett, J. R. 1970. Characteristics of Nevada Hunters. Agriculture Experiment Station, Max C. Fleischmann College of Agriculture, University of Nevada, Reno. 66 pp.

Good, J. R., and J. A. Crawford. 1978. Factors Influencing Pronghorn Use of Playas in South Central Oregon. Proceedings of the Biennial Pronghorn Antelope States Workshop.

Griffith, G. K. 1962. Guidelines for Antelope Management. Interstate Antelope Conference, Boise, Idaho. Pp. 102-114.

Griffiths, D. 1902. Forage Conditions on the Northern Border of the Great Basin. U.S. Department of Agriculture Bureau of Plant Industry, Government Printing Office, Washington, D.C., Bulletin No. 15.

Hall, E. R. 1946. Mammals of Nevada. University of California Press, Berkeley. 642 pp.

Hazeltine, B. C., C. Saulisberry, and H. Taylor. 1961. They Came for Range and Left a Heritage. Western Livestock Journal 31:98-109.

Hess, M. 1974. Nevada Fish and Game Data Sheet, Game Division Binder, Reno.
-----. 1976. Nevada Fish and Game Data Sheet, Game Division Binder, Reno.

Holt, S. J., and L. M. Talbot. 1978. New Principles for the Conservation of Wild Living Resources. Wildlife Monographs, No. 59. 33 pp.

Hoover, R. L., C. E. Till, and S. Ogilive. 1959. The Antelope of Colorado. Colorado Department of Fish and Game, Denver, Technical Bulletin No. 4. 110 pp.

Hill, V. R. 1973. Water for Nevada, Forecast for the Future – Population. State Engineer's Office, Nevada Division of Water Resources, Report No. 5. 210 pp.

Kay, F. R. 1988. Nevada Survey of the Economic Value of Big Game Hunting, 1984-1986. Nevada Department of Wildlife, Bulletin No. 9.

King, T, and H. W. Steinhoff. 1978. Big Game Values. *In* Big Game of North America Ecology and Management. Wildlife Management Institute. Edited by J. L. Schmidt and D. L. Gilbert, Stackpole Books, Mechanicsburg, Pennsylvania.

Kuchler, A. 1964. Potential Natural Vegetation of the Conterminous United States. American Geographical Society, Special Publication No. 36. 116 pp + map.

LaRivers, I. 1962. Fishes and Fisheries of Nevada. Nevada State Fish and Game Commission, State Printing Office, 782 pp.

Larsen, P. 1964. Antelope Physiological Studies. Job Completion Report. Federal Aid Project W-93-R-6, Work Plan 4, Job 3, New Mexico Department of Game and Fish.

Leonard, Z. 1904. Leonard's Narrative Adventures of Zenus Leonard, Fur Trader and Trapper, 1831-1836. Edited by W. F. Wagner, The Burrows Bros. Co., Cleveland, Ohio.

Leopold, A. 1948. Game Management. Charles Scribner and Sons, New York. 481 pp.

Mace, R. V. 1949. Oregon's Pronghorn Antelope. Oregon State and Game Commission, Portland. 25 pp.

Mason, E. 1952. Food Habits and Measurements of Hart Mountain Antelope. Journal of Wildlife Management 16:387-390.

McLean, D. D. 1944. The Prong-horned Antelope in California. California Fish and Game Commission 30:221-241.

McNelly, J. G., Jr., and D. E. Worner. 1974. Water for Nevada, Forecast for the Future – Agriculture. State Engineer's Office, Nevada Division of Water Resources, Report No. 8. 210 pp.

Nelson, E. W. 1925. Status of the Pronghorn Antelope, 1922-1924. U.S. Department of Agriculture, Bulletin No. 1346. 64 pp.

Nesbit, W. H., and J. S. Parker. 1977. North American Big Game. The Boone and Crockett Club and the National Rifle Association of America, Washington, D.C. 367 pp.

Nevada Fish and Game. 1936-1938. Biennial Report of the State of Nevada Fish and Game Commission.

Oliver, W. H. 1977. Economics as a Wildlife Management Tool. International Association of Fish and Wildlife Agencies, Proceedings of the 1967 Convention, Vancouver, British Columbia. Pp. 82-93.

Prenslow, E. J. 1965. A Literature Review on Pronghorn Behavior. Colorado Department of Game, Fish, and Parks, Denver, Special Report No. 3. 28 pp.

Pursley, D. 1977. Illegal Harvest of Big Game During Closed Season. Western Law Enforcement Technical Committee. Mimeo Paper Presented at the Enforcement Workshop, Reno, Nevada.

Sager, G. V. 1941. Climate of Nevada. *In* Climate and Man. U.S. Department of Agriculture Yearbook of Agriculture, Washington, D.C. Pp. 979-988.

Schmidt, J. L. 1978. Care and Use of the Animal Harvested. *In* Big Game of North America Ecology and Management. Wildlife Management Institute. Edited by J. L. Schmidt and D. L. Gilbert, Stackpole Books, Mechanicsburg, Pennsylvania..

Selleck, D. M., and C. M. Hart. 1957. Calculating the Percentage of Kill From Age and Sex Ratios. California Fish and Game Commission.

Seton, E. T. 1929. Lives of Game Animals. Doubleday-Doran, New York 3:413-780.

Short, S. H. 1965. A History of the Nevada Livestock Industry Prior to 1900. M.A. Thesis, University of Nevada, Reno. 105 pp.

Spencer, C. C. 1941. Antelope With Locked Horns. Journal of Mammalogy 23:92.

Spillet, J. J., J. B. Low., and D. Sill. 1967. Livestock Fences – How They Influence Pronghorn Antelope Movements. Agricultural Experimental Station, Utah State University, Bulletin No. 470. 79 pp.

Spillman, W. J. 1903. U.S. Department of Agriculture Bureau of Plant Industry. Pp. 38-50.

Stanton, F. W. 1962. Relationship of Sagebrush Spraying to Antelope Welfare. Transactions of the Interstate Antelope Pronghorn Conference. Pp. 71-80.

Sundstrom, C. 1969. Some Factors Influencing Pronghorn Antelope Distribution in the Red Desert of Wyoming. Proceedings of the Western Association of Fish and Game Commissioners 49:255-264.

Sundstrom, C., W. G. Hepworth, and K. L. Diem. 1973. Abundance, Distribution and Food Habits of the Pronghorn. Wyoming Fish and Game Commission, Cheyenne, Bulletin No. 12. 61 pp.

Tsukamoto, G. K., and W. Diebert. 1969. A Preliminary Report of Nevada Pronghorn Food Habits During August and September. Transactions of the Interstate Antelope Pronghorn Conference. Pp. 7-13.

U.S. Department of Agriculture. 1905-1935. Yearbook of Agriculture. Government Printing Office, Washington, D.C.

U.S. Department of the Interior-BLM. January 1975. Range Condition Report Prepared for the Senate Committee on Appropriations.

-----. February 1975. Effects of Livestock Grazing on Wildlife, Watershed, Recreation and Other Resource Values in Nevada. 96 pp.

U.S. Fish and Wildlife Service. 1937-1970. Big Game Inventory of the U.S. Wildlife Leaflet. Bird and Mammal Laboratory, Division of Wildlife Research.

Voight, W. Jr. 1976. Public Grazing Lands Use and Misuse by Industry and Government. Rutgers University Press, New Brunswick, New Jersey. 359 pp.

Wagner, F. H. 1976. Effects of Livestock Grazing and the Livestock Industry. Preprint of Chapter in Wildlife and America Symposium, Convened by the Council of Environmental Quality, Washington, D.C.

Woody, J. B. 1968. Recreational Use of Isolated Rangelands in Northwestern Nevada. M.A. Thesis, University of Nevada, Reno.

Wright, P. L., and A. D. Sumner, Jr. 1962. Minimum Breeding Age in Pronghorn Antelope. Journal of Wildlife Management 26:100-101.

Yoakum, J. 1957. Factors Affecting Mortality of Pronghorn Antelope in Oregon. M.S. Thesis, Oregon State College, Corvallis. 112 pp.

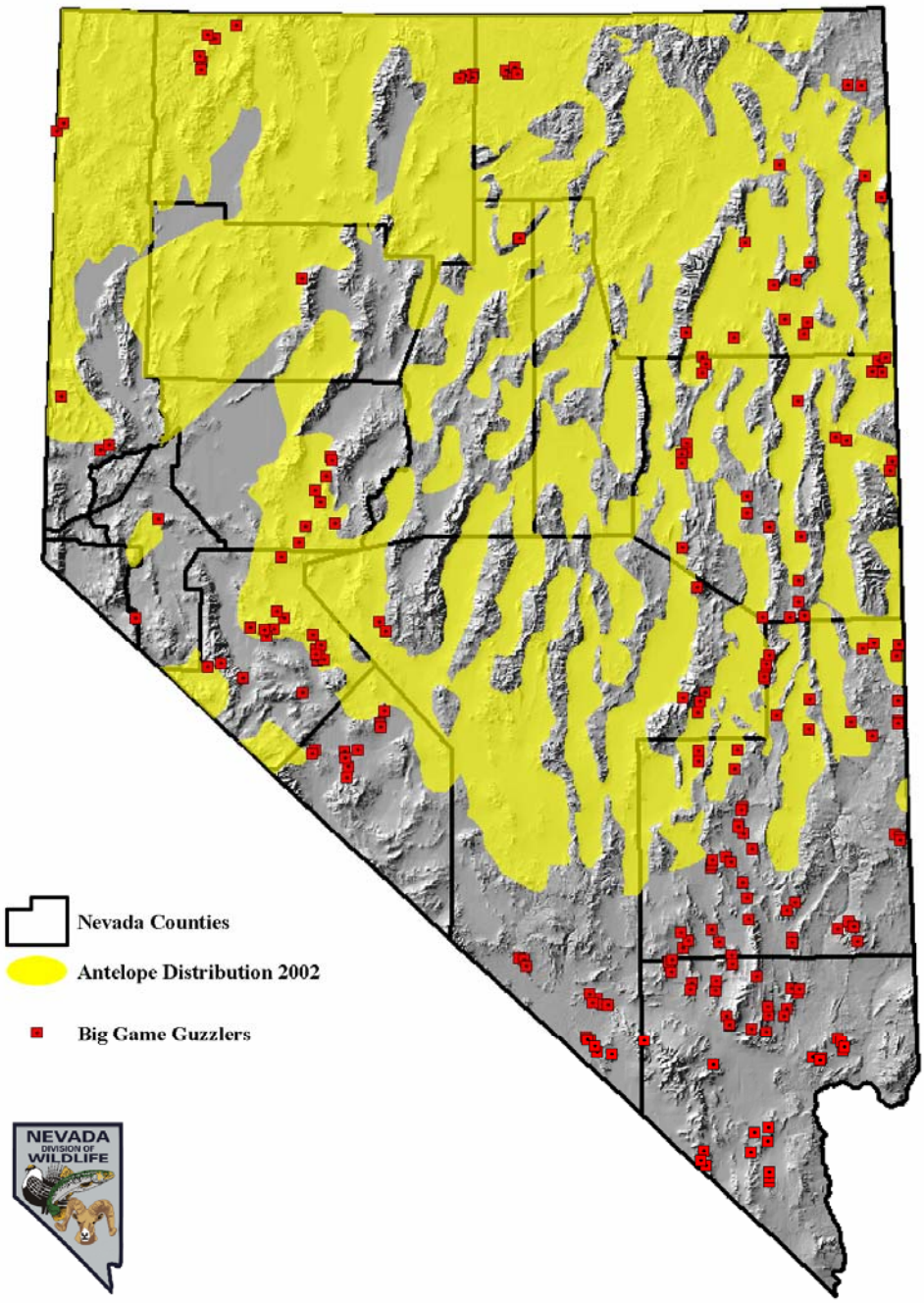
-----. 1958. Seasonal Food Habits of the Oregon Pronghorn Antelope. Transactions of the Interstate Antelope Pronghorn Conference.

-----. 1968. A Review of the Distribution and Abundance of American Pronghorn Antelope. Proceedings of the Antelope States Workshop, Casper, Wyoming.

-----. 1972. Antelope–Vegetative Relationships. Transactions of the Interstate Antelope Pronghorn Conference 5:171-177.

-----. 1980. Habitat Management Guides for the American Pronghorn Antelope. Technical Note 347. USDI-BLM Colorado State Office. 77 pp.

APPENDIX I
MAP OF BIG GAME WATER DEVELOPMENTS IN NEVADA



APPENDIX II
PLANT COMPOSITION OF PRONGHORN HABITAT IN NEVADA – Page 1

GROWTH HABIT	Scientific Name	COMMON NAME
FORBS	*Achillea millefolium*	common yarrow
	Agoseris spp.	agoseris
	Allium acuminatum	tapertip onion
	Amaranthus blitoides	mat amaranth
	Amsinckia spp.	fiddlenecks
	Arabis spp.	rockcresses
	Arenaria aculeata	prickly sandwort
	Arnica chamissonis	Chamisso arnica
	Astragalus mollissimus	woolly locoweed
	Astragalus purshii	woollypod milkvetch
	Balsamorhiza sagittata	arrowleaf balsamroot
	Blepharipappus scaber	rough eyelashweed
	Brassica *spp.*	mustards
	Camissonia tanacetifolia	tansyleaf evening-primrose
	Carduus *spp.*	plumeless thistles
	Castilleja angustifolia	northwestern Indian paintbrush
	Chaenactis macrantha	bighead dustymaiden
	Chaenactis steviodes	Steve's dustymaiden
	Chamaesyce albomarginata	whitemargin sandmat
	Chamaesyce fendleri	Fendler's sandmat
	Chamaesyce ocellata	Rattan's sandmat
	Chenopodium album	lambquarters
	Chenopodium murale	nettleleaf goosefoot
	Cirsium *spp.*	thistles
	Collinsia *spp.*	blue eyed Marys
	Comandra umbellata	pale bastard toadflax
	Convolvulus arvensis	field bindweed
	Cordylanthus *spp.*	bird's-beaks
	Crepis *spp.*	hawksbeards
	Cryptantha *spp.*	cryptanthas
	Delphinium andersonii	Anderson's larkspur
	Descurainia sophia	herb sophia
	Enceliopsis nudicaulis	nakedstem sunray
	Epilobium pygmaeum	smooth spike-primrose
	Epilobium *spp.*	willowherbs
	Erigeron bloomeri	scabland fleabane
	Erigeron pumilus	shaggy fleabane
	Eriogonum heermannii	Heermann's buckwheat
	Eriogonum ovalifolium	cushion buckwheat
	Eriogonum umbellatum	sulphur-flower buckwheat
	Eriogonum vimineum	wickerstem buckwheat
	Eriophyllum lanatum	common woolly sunflower
	Erodium cicutarium	redstem stork's bill
	Eryngium *spp.*	eryngos

PLANT COMPOSITION OF PRONGHORN HABITAT IN NEVADA – Page 2		
GROWTH HABIT	**Scientific Name**	**COMMON NAME**
FORBS (continued)	Fritillaria pudica	yellow fritillary
	Galium *spp.*	bedstraws
	Gilia *spp.*	gilias
	Halogeton glomeratus	saltlover
	Helianthus cusickii	Cusick's sunflower
	Helianthus petiolaris	prairie sunflower
	Iva axillaries	povertyweed
	Lactuca serriola	prickly lettuce
	Lagophylla ramosissima	branched lagophylla
	Lathyrus *spp.*	peas
	Lepidium montanum	mountain pepperweed
	Linum lewisii	prairie flax
	Lomatium nevadense	Nevada biscuitroot
	Lupinus brevicaulis	shortstem lupine
	Lupinus caudatus	tailcup lupine
	Machaeranthera canescens	hoary tanyaster
	Machaeranthera grindelioides	rayless tansyaster
	Madia *spp.*	tarweeds
	Medicago sativa	alfalfas
	Melilotus *spp.*	sweetclovers
	Oenothera caespitosa	tufted evening-primrose
	Oenothera flava	yellow evening-primrose
	Osmorhiza occidentalis	western sweetroot
	Penstemon albomarginatus	whitemargin beardtongue
	Penstemon deustus	scabland beardtongue
	Penstemon palmeri	Palmer's Penstemon
	Perideridia *spp.*	yampahs
	Phacelia crenulata	cleftleaf wildheliotrope
	Phlox caespitosa	tufted phlox
	Plantago lancelata	narrowleaf plantain
	Polygonum aviculare	prostrate knotweed
	Pyrrocoma racemosa	clustered goldenweed
	Ranunculus glaberrimus	sagebrush buttercup
	Rumex paucifolius	alpine sheep sorrel
	Rumex salicifolius	willow dock
	Salsola kali	Russian thistle
	Salsola tragus	Prickly Russian thistle
	Sanguisorba *spp.*	burnets
	Senecio integerrimus	lambstongue ragwort
	Sisymbrium altissimum	tall tumblemustard
	Sphaeralcea *spp.*	globemallows
	Symphyotrichum spathulatum	mountain aster
	Taraxacum officinale	common dandelion
	Thlaspi arvense	Field pennycress

PLANT COMPOSITION OF PRONGHORN HABITAT IN NEVADA – Page 3		
GROWTH HABIT	**Scientific Name**	**COMMON NAME**
FORBS (continued)	Trifolium longipes	droopflower clover
	Valeriana *spp.*	valerians
	Verbascum thapsus	common mullein
	Vicia *spp.*	vetches
	Viola *spp.*	violets
	Wyethia *spp.*	mule-ears
	Zigadenus paniculatus	foothill deathcamas
GRASSES	*Achnatherum hymenoides*	Indian ricegrass
	Agrostis gigantea	redtop
	Bromus briziformis	rattlesnake brome
	Bromus carinatus	California brome
	Bromus marginatus	mountain brome
	Bromus tectorum	cheatgrass
	Bouteloua gracilis	blue grama
	Cardaria draba	whitetop
	Danthonia spp.	oatgrasses
	Distichlis spicata	inland saltgrass
	Elymus elymoides	squirreltail
	Elymus trachycaulus	slender wheatgrass
	Eriogonum ovalifolium	cushion buckwheat
	Festuca idahoensis	Idaho fescue
	Hesperostipa comata	needle and thread
	Hordeum brachyantherum	meadow barley
	Hordeum jubatum	foxtail barley
	Hordeum vulgare	common barley
	Leymus cinereus	basin wildrye
	Phleum alpinum	alpine timothy
	Pleuraphis jamesii	James' galleta
	Poa pringlei	Pringle's bluegrass
	Poa secunda	Sandberg bluegrass
	Pseudoroegneria spicata	bluebunch wheatgrass
	Sporobolus spp.	dropseeds
	Thinopyrum intermedium	intermediate wheatgrass
	Triticum aestivum	common wheat
GRASS-LIKE	*Carex douglasii*	Douglas' sedge
	Eleocharis spp.	spikerushes
SHRUBS	*Ambrosia dumosa*	burrobush
	Arctostaphylos spp.	manzanitas
	Artemisia arbuscula	little sagebrush
	Artemisia bigelovii	Bigelow sage
	Artemisia cana	silver sagebrush
	Artemisia nova	black sagebrush
	Artemisia pygmaea	pygmy sagebrush
	Artemisia tridentata	big sagebrush
	Artemisia tripartita	threetip sagebrush
	Atriplex canescens	fourwing saltbush
	Atriplex confertifolia	shadscale saltbush
	Atriplex semibaccata	Australian saltbush
	Brickellia longifolia	longleaf brickellbush

PLANT COMPOSITION OF PRONGHORN HABITAT IN NEVADA – Page 4		
GROWTH HABIT	**Scientific Name**	**COMMON NAME**
SHRUBS (continued)	*Castilleja spp.*	paintbrushes
	Chrysothamnus viscidiflorus	yellow rabbitbrush
	Coleogyne ramosissima	blackbrush
	Ephedra nevadensis	Nevada jointfir
	Ericameria nauseosa	rubber rabbitbrush
	Grayia spinosa	spiny hopsage
	Gutierrezia sarothrae	broom snakeweed
	Krascheninnikovia lanata	winterfat
	Picrothamnus desertorum	bud sagebrush
	Prunus fasciculata	desert almond
	Purshia tridentata	antelope bitterbrush
	Ribes spp.	currants
	Rosa spp.	roses
	Salvia dorrii	purple sage
	Sarcobatus vermiculatus	greasewood
	Symphoricarpos albus	common snowberry
	Symphoricarpos longiflorus	desert snowberry
	Tetradymia glabrata	littleleaf horsebrush
TREES	*Amelanchier alnifolia**	Saskatoon serviceberry
	*Cercocarpus ledifolius**	curl-leaf mountain mahogany
	Juniperus occidentalis	western juniper
	Juniperus osteosperma	Utah juniper
	Juniperus scopulorum	Rocky Mountain juniper
	Pinus monophylla	singleleaf pinyon
	Pinus ponderosa	ponderosa pine
	Populus tremuloides	quaking aspen
	*Prunus virginiana**	chokeberry
	*Purshia mexicana**	Mexican cliffrose
	*Salix spp.**	willows
OTHER	*Bryophyta*	bryophytes
	Mycophycophyta	lichens
	Ferocactus cylindraceus	California barrel cactus
	Opuntia spp.	cacti, various
	Yucca spp.	yuccas

* Species of trees that may also grow as shrubs.

APPENDIX III PRONGHORN HARVEST STATISTICS – 1943-2002

YEAR	Tag Quota	Harvest	% Hunter Success	YEAR	Tag Quota	Harvest	% Hunter Success
1943	1000	253	25%	**1973**	450	285	63%
1944	500	137	27%	**1974**	555	282	51%
1945	250	120	48%	**1975**	485	217	45%
1946	1000	386	39%	**1976**	495	253	51%
1947	1000	371	37%	**1977**	462	362	78%
1948	CLOSED			**1978**	591	329	56%
1949	CLOSED			**1979**	594	358	60%
1950	300	125	42%	**1980**	685	436	64%
1951	450	278	62%	**1981**	745	479	64%
1952	CLOSED			**1982**	811	517	64%
1953	200	133	67%	**1983**	757	475	63%
1954	350	160	46%	**1984**	718	444	62%
1955	465	173	37%	**1985**	891	589	66%
1956	140	53	38%	**1986**	976	658	67%
1957	150	69	46%	**1987**	1039	722	69%
1958	190	126	66%	**1988**	1342	949	71%
1959	230	135	59%	**1989**	1378	980	71%
1960	225	146	65%	**1990**	1475	1115	76%
1961	335	211	63%	**1991**	1913	1311	69%
1962	270	152	56%	**1992**	1925	1416	74%
1963	300	182	61%	**1993**	1569	1020	65%
1964	335	204	61%	**1994**	1299	979	75%
1965	275	185	67%	**1995**	1387	878	63%
1966	275	191	69%	**1996**	1211	820	68%
1967	315	151	48%	**1997**	1173	805	69%
1968	370	193	52%	**1998**	1283	871	68%
1969	380	209	55%	**1999**	1521	1173	77%
1970	360	258	72%	**2000**	1615	1191	74%
1971	445	288	65%	**2001**	1518	1121	74%
1972	465	297	64%	**2002**	1655	1150	69%
				Totals:	**43,093**	**27,371**	
				Averages:	**756**	**477**	**63%**

APPENDIX IV PRONGHORN RELEASES IN NEVADA

Year	Site #	Release Site Name	#	Place of Origin
1950	**1**	S. Ruby Valley, White Pine Co.	**54**	Sheldon NWR, Humboldt County
	2	Monitor Valley, Nye County	**53**	Sheldon NWR, Humboldt County
1954	**3a**	Pine Valley, Eureka County	**71**	Yellowstone Natl. Park, Wyoming
	4	Smith Creek Valley, Lander Co.	**60**	Yellowstone Natl. Park, Wyoming
1957	**5**	Majuba Mountain, Pershing Co.	**46**	Yellowstone Natl. Park, Wyoming
	6	Ninemile Flat, Mineral County	**44**	Yellowstone Natl. Park, Wyoming
1984	**7**	White River Valley, Nye County	**80**	Utah
	8	Sand Springs Valley, Lincoln Co.	**26**	Utah
	3b	Pine Valley, Eureka County	**29**	Wyoming
	9	Bates Mountain, Lander County	**33**	Wyoming
	10	Pilot Valley, Elko County	**25**	Wyoming
	11	Antelope Valley, Eureka County	**41**	Wyoming
1985	**9**	Bates Mountain, Lander County	**40**	Oregon
	7	White River Valley, Nye County	**36**	Wyoming
	12	Dry Lake Valley, Lander County	**69**	Wyoming
	13	Goshute Valley, Elko County	**26**	Wyoming
1986	**14**	Steptoe Valley, White Pine Co.	**42**	Wyoming
1988	**15**	Ione Valley, Nye County	**94**	Granite Range, Washoe County
	16	Gollaher Mountain, Elko County	**44**	Granite Range, Washoe County
	1	S. Ruby Valley, White Pine Co.	**48**	Granite Range, Washoe County
1989	**17**	Garden Valley, Lincoln County	**105**	Utah
	16	Gollaher Mountain, Elko County	**50**	Utah
	18	Gabbs Valley Range, Mineral Co.	**20**	Utah
	12	Dry Lake Valley, Lander County	**56**	Utah
1990	**18**	Gabbs Valley Range, Mineral Co.	**30**	Utah
	19	Independence Valley, Elko Co.	**30**	Utah
	20	North Pequop Range, Elko Co.	**46**	Utah
1991	**19**	Independence Valley, Elko Co.	**30**	Utah
	21	S. Butte Valley, White Pine Co.	**69**	Utah
	22	Coal Valley, Lincoln County	**62**	Utah
1993	**23**	Newark Valley, White Pine Co.	**101**	Wyoming
1995	**1**	S. Ruby Valley, White Pine Co.	**50**	Colorado
	3b	South Pine Valley, Eureka County	**57**	Colorado
	24	Cave Valley, Lincoln County	**50**	Colorado
1997	**18**	Gabbs Valley Range, Mineral Co.	**53**	Oregon
1999	**25**	Churchill Canyon, Lyon County	**42**	Parker Mountain, Utah
	15	Ione Valley, Nye County	**49**	Parker Mountain, Utah
2000	**26**	Winecup Ranch, Elko County	**27**	Oregon, Umatilla Military Depot
2001	**27**	N. Smith Creek Valley, Lander Co	**49**	NE of Pueblo, Colorado
	28	Long Valley, White Pine County	**61**	NE of Pueblo, Colorado
	25	Churchill Canyon, Lyon County	**50**	Parker Mountain, Utah
	29	Jakes Valley, White Pine County	**50**	Parker Mountain, Utah
2003	**15**	Ione Valley. Nye County	**30**	Elko County
	29	Jakes Valley, White Pine County	**47**	
	21a	Butte Valley, White Pine Co.	**87**	
	24	Cave Valley, Lincoln County	**48**	
		TOTAL - 2,310		

APPENDIX V

History Of Pronghorn Hunting Seasons in Nevada -1861 to 2002

Year(s)	Dates	Hunt Type	Quota	Legal Animal Description
1861-1880	7/1 – 12/30	Rifle	None (no limit)	None
1881-1886	8/1 – 12/1	Rifle	None (no limit)	None
1887-1892	9/1 – 12/31	Rifle	None (no limit)	None
1893-1894	8/1 – 12/1	Rifle	None (no limit)	None
1895-1900	9/1 – 12/31	Rifle	None (no limit)	None
1901 - 1902	**CLOSED**			
1903 - 1908	9/15 – 11/15	Rifle	None (limit 3)	Does & spotted fawns illegal
1909 - 1912	9/15 – 10/15	Rifle	None (limit 2)	Does & spotted fawns illegal
1913 - 1914	10/15 – 11/15	Rifle	None (limit 2)	Does & spotted fawns illegal
1915 - 1916	9/15 – 10/15	Rifle	None	Does & spotted fawns illegal
1917 - 1920	**CLOSED**			
1921 - 1922	9/15 – 12/15 WA Co.(see Note)	Rifle	None	Horned animals only (except WA Co.: Nov. 10, 7:30-8:00 a.m.)
1923 - 1942	**CLOSED**			
1943	10/10 – 10/24	Rifle	1,000	Horns longer than ears
1944	?	Rifle	500	Horns longer than ears
1945	?	Rifle	250	Horns longer than ears
1946 – 1947	?	Rifle	1,000	Horns longer than ears
1948 – 1949	**CLOSED**			
1950	?	Rifle		Horns longer than ears
1951	9/1 – 9/9	Rifle		Horns longer than ears
1952	**CLOSED**			
1953	8/30 – 9/8	Rifle	200	Horns longer than ears
1954	8/29 – 9/7	Rifle	350	Horns longer than ears
1955	8/14 – 9/5	Rifle	465	Horns longer than ears
1956	8/26 – 9/3 8/12 – 8/26	Rifle	140	Horns longer than ears
1957	8/11 – 8/25 8/31 – 9/8	Rifle	150	Horns longer than ears
1958	8/24 – 9/7 8/31 – 9/7	Rifle	190	Horns longer than ears
1959	8/29 – 9/7	Rifle	180	Horns longer than ears
	8/30 – 9/13	Archery	--	Horns longer than ears
1960	8/27 – 9/5 8/28 – 9/5	Rifle	225	Horns longer than ears
1961	8/19 – 9/4 8/26 – 9/10 8/27 – 9/10	Rifle	335	Horns longer than ears

Year	Dates	Hunt Type	Quota	LEGAL ANIMAL DESCRIPTION
1962	8/25 – 9/3 8/26 – 9/9	Rifle	270	Horns longer than ears (Except Area 1C – either sex)
1963	8/24 – 9/2 8/25 – 9/8	Rifle	300	Horns longer than ears
1964	8/23 – 9/7 8/29 – 9/7	Rifle	335	Horns longer than ears
1965	8/28 – 9/6	Rifle	275	Horns longer than ears (Except Area 1C – either sex)
1966	8/27 – 9/5	Rifle	275	Horns longer than ears (Except Area 1B & 1C – either sex)
1967	8/26 – 9/4	Rifle	250	Horns longer than ears (Except Area 1B & 1C – either sex)
	8/5 – 8/25	Archery	65	Horns longer than ears
1968	8/24 – 9/2	Rifle	280	Horns longer than ears
	8/3 – 8/18	Archery	65	Horns longer than ears
1969	8/23 –9/2	Rifle	280	Horns longer than ears
	8/3 – 8/18	Archery	90	
1970	8/22 –8/29	Rifle	310	Horns longer than ears
	8/2 – 8/17	Archery	70	
1971	8/28 –9/6	Rifle	345	Horns longer than ears
	7/31 – 8/15	Archery	100	
1972	8/26 –9/4	Rifle	365	Horns longer than ears
	7/29 – 8/24	Archery	100	
1973	8/25 – 9/3 8/25 – 9/9 8/25 – 9/16	Rifle	355	Horns longer than ears
	7/28 – 8/19	Archery	200	
1974	8/24 – 9/2 8/24 – 9/8	Rifle	355	Horns longer than ears
	7/27 – 8/18	Archery	200	
1975	8/23 – 9/1 8/30 – 9/7	Rifle	285	Horns longer than ears
	7/26 – 8/17	Archery	200	
1976	8/21 – 8/29 8/28 – 9/6	Rifle	295	Horns longer than ears
	7/24 – 8/15	Archery	200	
1977	8/27 – 9/5 9/3 – 9/11	Rifle	412	Horns longer than ears
	8/13 – 8/21	Archery	50	
1978	8/26 – 9/4 9/2 – 9/11	Rifle	391	Horns longer than ears
	7/29 – 8/13	Archery	200	
1979	8/25 – 9/3 9/1 – 9/10	Rifle	394	Horns longer than ears
	8/4 – 8/24	Archery	200	

Year	Dates	Hunt Type	Quota	LEGAL ANIMAL DESCRIPTION
1980	8/23 – 9/1 8/30 – 9/7	Rifle	485	Horns longer than ears
	8/2 – 8/17	Archery	200	
1981	8/22 – 8/30 8/29 – 9/7	Rifle	545	Horns longer than ears
	8/8 – 8/21	Archery	200	
1982	8/21 – 8/30 8/28 – 9/6	Rifle	611	Horns longer than ears
	8/7 – 8/22	Archery	200	
1983	8/20 – 8/29 8/27 – 9/5	Rifle	557	Horns longer than ears
	8/7 – 8/21	Archery	200	
1984	8/20 – 8/290 8/27 – 9/5	Rifle (1)	514 Res. 4 NR	Horns longer than ears
	8/7 – 8/22	Archery	200	
1985	8/17 – 8/25 8/24 – 9/2	Rifle	687 Res. 4 NR	Horns longer than ears
	8/3 – 8/18	Archery	200	
1986	8/16 – 8/24 8/23 – 9/1	Rifle	772 Res. 4 NR	Horns longer than ears
	7/26 – 8/10 8/3 – 8/18	Archery	200	
1987	8/15 – 8/23 8/22 – 8/30	Rifle	798 Res. 41 NR	Horns longer than ears
	7/25 – 8/9 8/1 – 8/16	Archery	192 Res. 8 NR	
1988	8/13 – 8/17 8/20 – 8/24 8/20 – 8/28 8/27 – 8/31 8/27 – 9/5	Rifle	1,010 Res. 57 NR	Horns longer than ears
	7/23 – 8/7 7/30 – 8/14	Archery	192 Res. 8 NR	
	8/20 – 8/26	Rifle	50 Res.	***Either Sex***
1989	8/12 – 8/20 8/19 – 8/27 8/26 – 9/4	Rifle	1,103 Res. 55 NR	Horns longer than ears
	7/22 – 8/6 7/29 – 8/13	Archery	192 Res. 8 NR	
	3 seasons	Rifle	95 Res.	***Either Sex***

Year	Dates	Hunt Type	Quota	LEGAL ANIMAL DESCRIPTION
1990	8/11 – 8/19 8/18 – 8/26 8/19 – 8/27 8/26 – 9/4	Rifle	1,187 Res. 64 NR	Horns longer than ears
	7/21 – 8/5 7/28 – 8/12	Archery	186 Res. 14 NR	
1991	8/10 – 8/18 8/17 – 8/25 8/19 – 8/27 8/25 – 9/3	Rifle	1,449 Res. 88 NR	Horns longer than ears
	7/27 – 8/11 7/26 – 8/9	Archery (2)	243 Res. 13 NR	
	3 seasons	Rifle	95 Res.	***Either Sex***
1992	8/8 – 8/16 8/15 – 8/23 8/22 – 8/30	Rifle	1,494 Res. 83 NR	Horns longer than ears
	7/25 – 8/7 7/25 – 8/9	Archery	250 Res. 13 NR	
	8/1 – 8/21	Rifle	50 Res.	***Either Sex***
1993	8/14 – 8/22 8/21 – 8/29 8/28 – 9/6	Rifle	1,183 Res. 66 NR	Horns longer than ears
	7/31 – 8/13 7/31 – 8/15 8/7 – 8/22	Archery	187 Res. 14 NR	
	5 seasons	Rifle	119 Res.	Horns ***shorter*** than ears
1994	8/20 – 8/28 8/27 – 9/5 9/17 – 9/25	Rifle	1,058 Res. 59 NR	Horns longer than ears
	8/6 – 8/19 8/6 – 8/21 9/3 – 9/16	Archery	169 Res. 13 NR	
1995	8/19 – 8/27 8/26 – 9/4 9/16 – 9/24	Rifle	1,084 Res. 62 NR	Horns longer than ears
	8/5 – 8/18 8/5 – 8/20 9/2 – 9/15	Archery	173 Res. 12 NR	
	3 seasons	Rifle	45 Res.	Horns ***shorter*** than ears
1996	8/17 – 8/23 8/24 – 9/2 9/21 – 10/4	Rifle	979 Res. 55 NR	Horns longer than ears
	8/3 – 8/16 8/3 – 8/18 9/7 – 9/20	Archery	156 Res. 11 NR	

Year	Dates	Hunt Type	Quota	LEGAL ANIMAL DESCRIPTION
1997	8/23 – 9/1 9/16 – 9/22 9/20 – 10/3	Rifle	932 Res. 53 NR	Horns longer than ears
	8/2 – 8/15 8/2 – 8/17 9/6 – 9/19	Archery	112 Res. 11 NR	
	3 seasons	Rifle	45 Res.	Horns ***shorter*** than ears
1998	8/15 – 8/21 8/22 – 9/13 9/5 – 9/13 9/19 – 10/4	Rifle	1,072 Res. 57 NR	Horns longer than ears
	8/1 – 8/14 8/1 – 8/16 9/5 – 9/18	Archery	125 Res. 13 NR	
1999	8/21 – 8/27 8/28 – 9/6 8/28 – 9/12 9/4 – 9/12 9/18 – 10/3	Rifle	1,157 Res. 56 NR	Horns longer than ears
	8/7 – 8/20 8/7 – 8/22 9/4 – 9/17	Archery	140 Res. 9 NR	
	3 seasons	Rifle	45 Res.	Horns ***shorter*** than ears
2000	8/19 – 8/25 8/26 – 9/4 9/2 – 9/10 9/16 – 10/1	Rifle	1,237 Res. 60 NR	Horns longer than ears
	7/29 – 8/13 8/5 – 8/20 9/2 – 9/15	Archery (3)	193 Res. 7 NR	
2001	8/18 – 8/24 8/25 – 9/3 9/1 – 9/9 9/15 – 9/30	Rifle	1,085 Res. 56 NR	Horns longer than ears
	7/28 – 8/12 8/4 – 8/19 9/1 – 9/14	Archery	184 Res. 8 NR	
	5 seasons	Rifle	157 Res.	Horns ***shorter*** than ears

Year	Dates	Hunt Type	Quota	LEGAL ANIMAL DESCRIPTION
2002	8/17 – 8/23 8/22 – 9/2 8/24 – 9/2 8/31 – 9/8 9/14 – 9/29	Rifle	1,166 Res. 63 NR	Horns longer than ears
	7/27 – 8/11 8/3 – 8/18 8/31 – 9/13	Archery	286 Res. 10 NR	
	2 seasons	Rifle	110 Res.	Horns ***shorter*** than ears

(1) 1984 – Initial year that nonresident quotas were authorized.
(2) Archery quotas were indexed to the rifle quotas from 1991 to 2000.
(3) Archery quotas were calculated using the demand success formula of Commission Policy 20.

Tag quotas do not include tags sold through the Partnership in Wildlife, Heritage, Landowner Damage Compensation and *Emergency* Depredation Hunt programs.

NEVADA'S PRONGHORN ANTELOPE

Ecology, Management and Conservation

MAY 2003